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U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDE PROGRAMS

TECHNICAL SERVICES DIVISION
Rm. EB-49, 401 M Street, S.W.
Washington, D.C. 20460

PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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74-0760. Heddergott, H. (Inst. fuer Pflanzenschutz, Saatguntersuchung und Bienenkunde der Landwirtschaftskammer Westfalen-Lippe, Muenster, Germany). **Die Uebermittlung von Forschungsergebnissen auf dem Gebiete der Phytomedizin an die Praxis des Pflanzenbaus aus supranationaler Sicht. [The transfer of research results in phytomedicine to practical application in plant production from an international viewpoint.]** *Gesunde Pflanz. 24(8): 129-139; 1972.* (German)

The need for and possible means of transferring research results in phytomedicine to the practice of plant production are pointed out. The enormous disparity between the extensive use of pesticides and the insufficient knowledge concerning the chemical and physical action mechanisms and concerning the biological and general ecologic consequences should be narrowed. Close contacts must be established between research institutions, pesticide manufacturers, and plant protection services, as epitomized by the Agricultural Extension Services System in the USA. Coordination and synchronization of scientific research and practice in plant production, as well as information and counseling on pest harazds, toxicity, and cumulation of pesticides, and the maximum allowable pesticide residue concentrations in various crops will be essential.

74-0761. Drees, H. (Bonn, Germany). **Organische Herbizide im Ackerbau. [Organic herbicides in agriculture.]** *Gesunde Pflanz. 24(9): 152-158; 1972.* (5 references) (German)

About 18,500 tons of pesticide active ingredients were applied in West Germany in 1971; 60% of this amount represented herbicides. Almost half of the quantity of herbicide applied, or 5200 tons, consisted of phenoxyacetic acids; triazines and urea derivatives accounted for 38% of the herbicides applied. More than one third of the arable land in West Germany was treated with herbicides in 1971. The growth-regulating herbicides (phenoxy acids) have oral LD50 doses in rats of about 0.7-1.2 g/kg; tolerances for these herbicides in or on grain are in the range of 0.05-0.1 ppm. Fish toxicity and possible dioxin contamination are problems with 2,5,4-T. A typical triazine herbicide, terbutryne, has an LD50 of about 3 g/kg in the rat; the tolerance is 0.05 ppm. Terbutryne has limited persistence in soil – 3-10 weeks, depending on the soil type. Substituted urea herbicides, e.g., methabenzthiazuron, persist in soil for about 4-6 months; the LD50 is about 2.5 g/kg. Miscellaneous chemical classes include phenolics (e.g., bromofenoxim , LD50 1.2 g/kg) and dinitro compounds (oral LD50 in the rat less than 0.05 g/kg). The nitro compounds are also dangerous to bees. Numerous combinations of active ingredients are marketed.

74-0762. Foster, E. M. (Food Res. Inst., Univ. Wisconsin, Madison, WI 53706). **Science, politics, and a safe food supply.** *J. Amer. Vet. Med. Ass. 163(9): 1056-1060; 1973.*

A number of food safety questions involve a conflict between scientific and political considerations. Replacement of chemical insecticides with biological agents such as pathogenic viruses and bacteria is strongly advocated by some consumer groups. At least one insecticidal bacterium, *B. thuringensis*, is available, but the safety of these agents may not be any easier to prove than that of the chemicals. Since living organisms mutate and respond to their environment, the effects of releasing enormous numbers of bacterial and viral agents are unknown. Many of the decisions made by the FDA have been forced by political pressure and are based on unscientific reasoning. To eliminate this type of decision the area of food safety should be more fully researched.

74-0763. Anonymous. **Allemagne: residus de pesticides dans les fruits et legumes. [Germany: Pesticide residues on fruits and vegetables.]** *Phytoma 25(247): 34; 1973.* (French)

During an interview in 1972, the West German Minister of Public Health discussed pesticide residue levels in German and imported fruits and vegetables. Nearly 80% of all fruit and vegetable samples analyzed did not contain pesticide residues; nearly 20% contained residues well within the allowable limits; only 2% contained residue concentrations exceeding limits. Since only very low levels of pesticides are allowed in German products, repeated consumption of fruits and vegetables is not harmful to human health.

74-0764. Mabbett, A. N. (U.S. Army, Honolulu, HI). **The U. S. Army program for pollution abatement.** *IN: Proceedings of the Conference in the Matter of Pollution on the Navigable Waters of Pearl Harbor and its Tributaries in the State of Hawaii, 1971, pp. 326-343.*

The U. S. Army has a comprehensive program which involves identification of environmental pollution problems in Army installations and activities, establishment and enforcement of corrective measures, monitoring of existing environmental control measures to ensure that these maintain the required degree of pollution control, and maintenance of communication with federal, state, and local pollution abatement authorities. An extensive pesticide program is one of the Army's water pollution abatement and control projects. Within this program the use of DDT in outside areas has been halted, as well as the spraying of lawns and similar areas for the control of army and web worms. Parasites, predators, and diseases of these insects are being used. Chromate-containing agents used in controlling slime in air conditioning systems have also been eliminated. (Material for this article was presented at the conference on the above held in Honolulu, Hawaii, September 21-23, 1971.)

74-0765. Golding, D. (Dole Pineapple Co., Honolulu, HI). **Pollution control procedures of the Dole Pineapple**

Company. *IN: Proceedings of the Conference in the Matter of Pollution on the Navigable Waters of Pearl Harbor and its Tributaries in the State of Hawaii, 1971, pp. 358-360.*

Fertilizers and agricultural chemicals approved for use on pineapple are used in minimum amounts on the Dole Pineapple Company's plantation in the Pearl Harbor Basin. Percolation rates are good and soil runoff would be expected only from fields in preparation or newly planted. The herbicides used, Karmex (diuron) and Hyvar X (bromacil), are strongly fixed in Hawaiian soils, making leaching unlikely. There is no data showing pesticides in surface or ground water in significant amounts from these pineapple operations.

74-0766. Meuser, F. (Technische Universitaet Berlin, Seestrasse 11, Postfach 65480 D-1, Berlin 65, Germany). **Metabolische Austauschreaktionen von Enzymen und Insektiziden waehrend der Getreidelagerung. [Metabolic interactions between enzymes and insecticides during grain storage.]** *Ann. Technol. Agr. 21(4): 515-533; 1972.* (25 references) (German)

Metabolic interactions of cereal enzymes of potentially high activity with insecticides used to protect grains during storage were studied. Some of the enzymes are sufficiently nonspecific to degrade insecticides. This effect can be strengthened by microorganisms which can use foreign substances as substrates. The rate of phosphine metabolism in fumigated wheat grains was essentially determined by the water activity of the grain. High water levels increased the enzyme activity and facilitated the penetration of the insecticide. Malathion and dimethoate were metabolized by amidases, phosphatases, and esterases into carboxyl derivatives, which could then be decarboxylated. Organophosphorus insecticides are rather readily attacked by the grain enzymes, but organochlorine pesticides are scarcely degraded. Under anaerobic conditions DDT is metabolized to TDE, possibly by catalase, cytochrome C, and peroxidase.

74-0767. Best, S. M. (Anim. Industry Agr. Branch, Dept. N. Territory, Darwin, N. T., Australia, 5790). **Some organochlorine pesticide residues in wildlife of the Northern Territory, Australia, 1970-1971.** *Aust. J. Biol. Sci. 26(5): 1161-1170; 1973.* (20 references)

Predators, scavengers, and herbivores from arid and tropical, undeveloped and developed areas in Northern Territory, Australia, were collected in 1970-1971 and analyzed for organochlorine residues in fatty tissue. One or more of five organochlorines (DDE, dieldrin, hexachlorobenzene, DDT, and TDE) were found in 38% of samples from the arid zone undeveloped area. One or more of these compounds plus lindane were found in 41% of the samples from the tropical zone undeveloped area. Most of these residues ranged from 0.01 to 0.30 ppm. Up to 30 times these concentrations were found in animals from developed areas. Residues were detected in 94% of samples from the arid developed area and 69% of the samples from the tropical developed area. Endrin and aldrin were also detected in some of these samples.

74-0768. Casanova, M.; Dubroca, J. (Lab. Phytopharmacie, I.N.R.A., Route de Saint-Cyr, 78-Versailles, France). **Residus de pentachloronitrobenzene et de son impurete l'hexachlorobenzene dans les sols et les laitues. [Residues of pentachloronitrobenzene and its impurity hexachlorobenzene in soil and lettuce.]** *C. R. Seances Acad. Agr. Fr. 58(12): 990-998; 1973.* (1 reference) (French)

Pentachloronitrobenzene (PCNB) and HCB residues were determined in soils and in the lettuce and endive grown in these soils. Technical pentachloronitrobenzene contained up to 6.2% of HCB as an impurity. Soil samples taken after application of pentachloronitrobenzene at expenditures of 15 and 45 kg/ha contained 20.40 ppm and 69.10 ppm of pentachloronitrobenzene and 0.50 ppm and 1.86 ppm of HCB respectively. The total pentachloronitrobenzene and HCB residue contents 8 weeks after application of a dose of 15 kg/ha ranged from 5 to 21 ppm. The pentachloronitrobenzene and HCB residues in lettuce grown in soils previously treated with 15 and 45 kg/ha doses were 0.73 and 1.56 ppm and 0.01 and 0.02 ppm. Lettuce grown in non-treated soil contained 0.12 ppm while that grown in soil treated with 30 kg/ha doses had 0.87 ppm of pentachloronitrobenzene. Endive investigated contained 0.015-0.075 ppm of pentachloronitrobenzene and 0.0002-0.035 ppm of HCB. The results indicate that pentachloronitrobenzene should be applied at rates less than 30 kg/ha.

74-0769. Hascoet, M.; Kerhoas, L. (Lab. de Phytopharm., I.N.R.A., Versailles, France). **Etude experimentale de la contamination du lait par les insecticides organochlores presents dans la nourriture de l'animal. [Experimental study of milk contamination by organochlorine insecticides present in animal feed.]** *C. R. Seances Acad. Agr. Fr. 58(12): 998-1005; 1973.* (6 references) (French)

Feed containing BHC (with equal fractions of alpha and gamma isomers), heptachlor epoxide, and dieldrin was fed to cows to study the corresponding residue levels in milk. Tests also established maximum allowable concentrations of α-BHC, γ-BHC, heptachlor epoxide, and dieldrin in feed to ensure a maximum residue level of 0.1 ppm in milk. Continuous administration of pesticides did not cause linear increases in the residue concentrations in the milk, and an equilibrium between ingestion and elimination was established in about 40 days. At the end of the lactation period, the daily amount of pesticides excreted in milk remained constant temporarily and later increased. The equilibrium between pesticide ingestion and elimination was reached at a heptachlor epoxide residue level of 1.80 ppm, α-BHC residue level of 0.8-0.9 ppm, and a lindane residue level of 0.1 ppm in the milk. The rates of transfer from feed into milk were 37% for heptachlor epoxide, 27.4% for dieldrin, 1.5% for lindane, 16.1% for α-BHC, and 13.4% for β-BHC. In order not to exceed a maximum residue level of 0.1 ppm in milk, the feed fed to lactating cows should not contain more than 0.03 ppm α-BHC, 0.04 ppm β-BHC, 0.33 ppm lindane, 0.01 ppm heptachlor epoxide, and 0.02 ppm dieldrin at a daily feed consumption of 10 kg.

74-0770. Nordblom, G. D. (Colorado State Univ., Fort Collins, CO). **Chlorinated pollutant photodynamics.** *Diss. Abstr. Int. 34(6): 2527B; 1973.*

DDT was photolyzed in ethanol and cyclohexane with 3100 A light. Under nitrogen the reaction yielded DDE and HCl. The reaction is quenched by oxygen and inhibited by *n*-hexyl mercaptan. The photochemistry of DDT evolves from a triplet excited state. Photolysis at 2537 A produced a complex reaction mixture and was not quenched by piperylene or oxygen or inhibited by mercaptan. Oxygen quenching at 3100 A may explain the inefficiency of DDT degradation by sunlight. Two DDT analogs, *N*-(*a*-trichloromethyl-*p*-methoxybenzyl)-*p*-methoxyaniline and *N*-(*a*-trichloromethyl-*p*-methoxybenzyl)-*p*-methylaniline, were photolyzed in diethyl ether under oxygen with 3100 A light. Quantitative yields of *p*-methoxy-*a*-dichloroacetophenone and *p*-methoxy or *p*-methylanilinium hydrochloride were formed. Photolysis of 4,4′-dichlorobiphenyl (DCB) in alcoholic solvents under nitrogen at 3100 A yielded 4-chlorobiphenyl (MCB) and HCl. The reaction is quenched by oxygen and inhibited by *n*-hexylthiol, *t*-butyl disulfide, and to a small extent by di-*n*-butyl sulfide. An exiplex effect is discussed. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-29,055.)

74-0771. Lane, R. H. (Louisiana State Univ. and Agr. and Mech. College, Baton Rouge, LA). **Influence of food processing on mirex.** *Diss. Abstr. Int. 34(6): 2685B; 1973.*

Food processing may aid in removing pesticide residues from foods. Tissue samples and eggs contaminated with mirex, an organochlorine insecticide, were obtained from crawfish and mallard ducks previously exposed to fire ant bait containing 0.3% technical mirex. Crawfish were subjected to a commercial thermal processing procedure (121°C, 15 psig, 13 min); eggs and crawfish were also subjected to a more drastic heat treatment (124°C, 18 psig) for 2 and 6 hours, respectively. Mean mirex contents of processed samples after treatment did not differ from those of unprocessed controls according to an analysis of variance. Mirex residues in crawfish tissues irradiated with ultraviolet light for 12 and 24 hours did not differ from those of controls; however, mean mirex levels in gamma-irradiated or photolytically treated eggs differed significantly from those in controls with increasing time of irradiation. Mirex degradation and new product formation were followed by chromatography. Monohydro and dihydro derivatives of mirex were characterized. Eight UV and gamma irradiation products were detected; tentative structures were assigned to four of these. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-27,849.)

74-0772. Sawinsky, A.; Pasztor, G.; Sandor, E. (Szolnok County Hygienic and Epidemiological Station, Szolnok, Hungary). **Vapona 48 EC-vel vegzett permetezes uzemi expozicios vizsgalata. [Exposure examination of spraying performed with Vapona 48 EC.]** *Egeszsegtudomany 17: 285-288; 1973.* (21 references) (Hungarian)

Air concentrations of Vapona 48 EC (dichlorvos) and dermal contamination were investigated during spraying in an orchard. The Vapona concentrations in the air averaged 1.19 mg/m^3, a relatively high value, possibly due to elevated ambient temperature. The rate of skin contamination was relatively high with 0.072 mg/100 cm^2 per hour. However, workers did not complain of symptoms indicative of poisoning following spraying. Serum cholinesterase activity increased by 4 to 37%. The measurement of the serum cholinesterase activity is consequently regarded as insufficient for the determination of the biological effect of the organophosphoric acid esters.

74-0773. Khan, S. U. (Res. Station, Canada Dept. Agr., Regina, Saskatchewan, Canada). **Interaction of humic acid with chlorinated phenoxyacetic and benzoic acids.** *Environ. Lett. 4(2): 141-148; 1973.* (10 references)

Humic acid adsorbed 44 μ moles/g dicamba, 30 μ moles/g 2,4-D, and 18 μ moles/g picloram and retained the herbicides during prolonged washing with distilled water or hexane extraction. The amounts of herbicide retained were approximately equivalent to 1% of the original weight of the humic acid. About 20% of the adsorbed herbicide could be removed with an ether-chloroform-acetic acid mixture, and about 60% could be removed by hexane after methylation. The results suggest that the chlorinated phenoxyacetic acids and benzoic acids used as herbicides form complexes with humic substances in soils; this could affect the activity, behavior, bio-availability, and degradation rate of these materials in soil and water.

74-0774. Meith-Avcin, N.; Warlen, S. M.; Barber, R. T. (66320 Portoroz, Marine Biol. Station, Yugoslavia). **Organochlorine insecticide residues in a bathyl-demersal fish from 2,500 meters.** *Environ. Lett. 5(4): 215-221; 1973.* (8 references)

Organochlorine residues were determined in livers of four fish, *Antimora rostrata*, collected at 2,500 m on the upper continental rise southeast of Cape Hatteras. Levels of aldrin, heptachlor, lindane, endrin, heptachlor epoxide, or mirex were not detectable. Average levels of those present were: 1.452 ppm *p,p′*-DDE, 0.620 ppm *p,p′*-DDD (TDE), 3.149 ppm *p,p′*-DDT, 0.209 ppm *o,p′*-DDT, and 0.017 ppm dieldrin. Determination of organochlorine residues in *Antimora rostrata* for the next five years will be useful for testing the time sequence for peak distribution of DDT in various levels of the ocean as predicted by Woodwell, Craig, and Johnson.

74-0775. Fricke, G. (Pflanzenschutzamt des Landes Schleswig-Holstein, Kiel, Germany). **Die Kontamination von Boeden mit chlorierten Kohlenwasserstoffin-**

sektiziden im Vergleich von 1969 zu 1972. (Mitt. I. Feldgemuesebau). [Comparison of the soil contamination with organochlorine insecticides in 1969 and 1972. (Part 1: Large-scale vegetable gardening).] *Gesunde Pflanz. 24(11): 177-179; 1972.* (6 references) (German)

The aldrin, lindane, dieldrin, and DDT residue levels were compared through GLC of 114 soil samples taken from the upper 25 cm layer of soil used for vegetable gardening in 1969 and 1972, after the prohibition of the use of aldrin, dieldrin, and DDT. Thirty-three per cent of all samples, corresponding to 48% of the investigated vegetable gardening area, was free from aldrin, dieldrin, lindane, and DDT in 1969. The aldrin and dieldrin residues ranged from 0.01-0.001 ppm; the DDT residues ranged from 0.1 to 0.01 ppm. The aldrin-dieldrin residue levels were highest in cabbage seedling patches. Soil samples from fields that had contained pesticide residues in 1969 had aldrin, lindane, and DDT residues about one tenth the 1969 values; the corresponding decrease in the dieldrin content was 50%. The average aldrin, dieldrin, lindane, and DDT residue levels in 1972 were 0.002, 0.019, 0.013, and 0.015 ppm, as compared with the corresponding figures of 0.020, 0.043, 0.180, and 0.102 as determined in 1969.

74-0776. Georgii, H. W. (Author address not given). **DDT in der Biosphaere. [DDT in the biosphere.]** *Hippokrates 44(1): 98-100; 1973.* (6 references) (German)

DDT requires twenty years to degrade and in the interim accumulates in the ground, atmosphere, oceans, and plants and animals. Some 20,000 tons of DDT per annum are washed out from the atmosphere by precipitation. While plants and animals as DDT reservoirs are unremarkable, they can accumulate DDT to one million times the overall environmental DDT concentration. The ban imposed recently on the use of DDT in an increasing number of countries has already resulted in partial decrease in DDT residue contents as in salmon in Sebago Lake (Maine, U.S.). The general decline in the DDT contamination of the environment is, however, counteracted by the continued, and even stepped-up use of DDT among developing nations. DDT concentrations in the air and in surface waters, especially oceans, correlated with DDT output.

74-0777. Hori, Y.; Kawai, Y.; Tankawa, Y.; Yamamoto, I.; Shitara, Y.; Mori, K. (Hokkaido Inst. of Pub. Health, Sapporo, Japan). **[Studies on the agricultural chemical residues in foods, Part 2. Pesticide residues in vegetables and fruits produced in Hokkaido in 1971 and 1972.]** *Hokkaidoritsu Eisei Kenkyushoho (Rep. Hokkaido Inst. Pub. Health) 23: 81-85; 1973.* (3 references) (Japanese)

Vegetable and fruit samples were collected and each 1 kg finely chopped. Fifty-one grams of chopped specimen were then extracted three times with acetonitrile and the extract partitioned by *n*-hexane. Clean-up with Florisil and gas chromatography with ECD were then used for residue determinations. BHC residues were below the maximum permitted levels in all samples: maximum β-BHC was 0.085 ppm in spinach. DDT residues were greater than the permitted level (0.2 ppm) in only one spinach sample at 0.265 ppm. Dieldrin residues were greater than the permitted level of 0.005 ppm in two spinach and one potato sample from 1971 and three spinach and one potato from 1972. Endrin residues were greater than the permitted level (0.005 ppm) in only one sample from a Japanese radish top.

74-0778. Hori, Y.; Kawai, Y.; Tankawa, Y.; Yamamoto, I.; Shitara, Y.; Mori, K. (Hokkaido Inst. Pub. Health, Sapporo, Japan). **[Studies on the agricultural chemical residues in foods, Part 3. Pesticide residues in dairy products and meats produced in Hokkaido in 1971 and 1972.]** *Hokkaidoritsu Eisei Kenkyushoho (Rep. Hokkaido Inst. Pub. Health) 23: 86-93; 1973.* (8 references) (Japanese)

Thirty-nine specimens of commercial milk (from Sept. 1971 to Mar. 1973), 13 of butter, 3 of cheese, 23 of specially modified powdered milk (Oct. 1971 to Mar. 1973), 25 of beef, 23 of pork, and 35 of domestic fowl (from Oct. 1971 to Sept. 1972) were collected in Hokkaido and analyzed for pesticide residues. The existing temporary standards for β-BHC, total DDT, and dieldrin plus aldrin in cow's milk are 0.2, 0.05, and 0.005 ppm. Although BHC and DDT were detected in all specimens, a maximum value of 0.011 ppm for BHC was established. The maximum residue of DDT was 0.041 ppm for milk from 1971. Only a few specimens had dieldrin residues, and aldrin and endrin were almost never detected. BHC and DDT were detected in all butter specimens, and δ-BHC, although found in butter, was not detected in milk. Highest residue contents were total BHC 0.394, total DDT 0.803, and total polychlorocyclodienes 0.055 ppm. Residues in cheese differed considerably among manufacturers: β-BHC values of 0.046 vs. 0.003 ppm and γ-BHC values of 0.020 vs. 0.006 ppm were found. DDT levels also varied, with the highest being 0.149 ppm. In powdered milk a greater amount of γ-BHC (lindane) was detected than other isomers (0.173-0.003 ppm), but total DDT was less. Heptachlor was detected in only one specimen at 0.043 ppm. BHC, DDT, and polychlorocyclodienes were detected in all beef specimens: trace-0.266 ppm of β-BHC, 0.034-0.452 ppm of total BHC, trace-0.845 ppm of DDT, N. D.-0.089 ppm of dieldrin, and a small amount of endrin and aldrin (only in 1971). Residues in pork on a fat basis ranged from trace-0.173 ppm β-BHC, 0.092-0.556 ppm total BHC, 0.078-3.311 ppm total DDT, and N.D.-0.019 ppm dieldrin. Residues were higher in 1972 than in 1971. Residues in chicken on a fat basis were trace-0.291 ppm β-BHC, 0.051-0.967 ppm of total BHC, 0.508-2.658 ppm DDT, and N.D.-0.109 ppm dieldrin.

74-0779. Saito, M.; Kitayama, M. (Hokkaido Inst. Pub. Health, Sapporo, Japan). **[Studies on the prevention of poisoning by agricultural chemicals, Part 18. Water pollution by sodium chlorate herbicide strewed on forest regions from helicopter, III.]** *Hokkaidoritsu Eisei Kenkyushoho (Rep. Hokkaido Inst. Pub Health) 23: 94-98; 1973.* (3 references) (Japanese)

Fifty percent cylindrical or spherical herbicidal formulations of sodium chlorate were distributed from a helicopter on three forest regions in Hokkaido at the rate of 200-230 kg (formulation)/ha. Water in the springs, the valleys, and the rivers from the area was analyzed for sodium chlorate one hour and 1, 2, 3, 5, 10, 20, and 30 days after the treatment. Water collected at a point more than 770 m from the distribution site, where the flow rate was over 2.87 cu m/sec, had no sodium chlorate one hour after distribution. Sodium chlorate was not detected in any water specimen collected 10 days after distribution.

74-0780. Saito, M.; Kitayama, M. (Hokkaido Inst. Pub Health, Sapporo, Japan). **[BHC and DDT residues in arable soil.]** *Hokkaidoritsu Eisei Kenkyushoho (Rep. Hokkaido Inst. Pub. Health) 23: 116; 1973.* (Japanese)

Soil specimens from four paddy fields and three arable lands were collected in Nov.-Dec. 1972 and analyzed for α-, β-, γ-, and δ-BHC, *p,p'*-DDT, and *p,p'*-DDE to assess the effect of the May 1, 1971, ban on BHC and DDT. The values found for the two types of land were 0.007-0.047 and 0.001-0.005 of α-BHC in paddy and field; 0.150-0.435 and 0.003-0.013 of β-BHC; 0.529-0.848 and 0.013-0.069 of γ-BHC; 0.016-0.064 and trace-0.002 of δ-BHC; 0.051-0.232 and 0.135-0.845 of *p,p'*-DDT; and 0.009-0.045 and 0.018-0.69 ppm of *p,p'*-DDE. When these values were compared to those obtained two years before, considerable decreases were seen in both γ-BHC and *p,p'*-DDT. γ-BHC in a paddy field decreased from 0.935 to 0.490 and *p,p'*-DDT from 0.052 to 0.036 ppm; γ-BHC in arable land decreased from 0.192 to 0.069 and *p,p'*-DDT from 1.272 to 0.845 ppm (all the values on an air-dried soil basis). The percentage decrease fluctuated, probably owing to the amounts of the insecticides applied, properties of the soil, the method of cultivation, and weather conditions.

74-0781. Arshidinov, A. A.; Isin, M. M. (Kazakh Sci. Res. Inst. Fruit-Growing and Vinicult., USSR). **Ostatochnoye kolichestvo simazina v pochve i v razlichnykh organakh i chastyakh yabloni. [Residual amounts of simazine in the soil and in different organs and parts of apple trees.]** *Izv. Akad. Nauk Kaz. SSR, Ser. Biol. 11(2): 30-33; 1973.* (8 references) (Russian)

Simazine residues were determined in the soil, roots, leaves, bark, bole, and fruits of apple trees at different times after soil application of 6, 8, 10, and 12 kg/ha doses. Simazine first concentrated in the upper 10 cm soil layer, reaching concentrations of 0.0312-0.011 mg/kg, and gradually penetrated up to 60 cm in three years. The simazine residue levels in leaves, roots, boles, and bark ranged from 0.011-0.0712 mg/kg, 0.0132-0.0450 mg/kg, traces to 0.0260, and traces to 0.0670 mg/kg. Simazine residues were 0.0077 mg/kg and 0.0755 mg/kg in unripe apples grown on trees previously treated with doses of 10 and 12 kg/ha, but were undetectable in ripe apples. The simazine dose to be applied in apple orchards is limited to 8 kg/ha.

74-0782. Tanabe, M.; Dehn, R. L.; Bramhall, R. R. (Stanford Res. Inst., Menlo Park, CA 94025). **The photochemistry of imidan in diethyl ether.** *J. Agr. Food Chem. 22(1): 54-56; 1974.* (11 references

The photolysis of imidan, *O,O*-dimethyl *S*-phthalimidomethyl phosphorodithioate, in diethyl ether has produced two isolable products in low yield, *N*-methylphthalimide and *N*-methoxymethylphthalimide. Neither of these was insecticidally active. Photolysis of *N*-methylphthalimide demonstrated the occurrence of photoreduction and photoaddition to the imide system which in part may contribute to the complex mixture of minor photoproducts observed in the imidan photolyses. No photoproduct containing phosphorus or sulfur could be isolated from the many minor components. (Author abstract, supplemented, reprinted by permission of the American Chemical Society)

74-0783. Long, J. W.; Thompson, L., Jr. (Amchem Products, Inc., Ambler, PA 19002). **Herbicide residues in air-cured burley tobacco.** *J. Agr. Food Chem. 22(1): 82-86; 1974.* (11 references)

Mature cured leaves from three stalk positions of tobacco (*Nicotiana tabacum* cv. Ky 14) treated in the field with *N*-butyl-*N*-ethyl-α,α,α-trifluoro-2,6-dinitro-*p*-toluidine (benefin), *N,N*-dimethyl-2,2-diphenylacetamide (diphenamid), or *S*-propylbutylethylthiocarbamate (pebulate) were analyzed for herbicide residues using GLC. Benefin was detected in trace amounts (2 to 4 ng/g of dry wt) in the upper leaves from treated plants. Slightly higher amounts occurred in leaves from the bottom of the plant. Diphenamid was detected in amounts as high as 0.16 μg/g of dry wt. The highest levels were from leaves taken from the middle portion of treated plants. Two peaks consistently appeared in chromatographs from treated plants that were not present in the chromatographic record of untreated (control) plants. One of the peaks was tentatively identified as *N*-methyl-2,2-diphenylacetamide. Pebulate was not present in the leaves from treated plants at the lower limit of detection (0.02 μg/g of dry wt). (Author abstract reprinted by permission of the American Chemical Society)

74-0784. Que Hee, S. S.; Sutherland, R. G. (Dept. of Chem. Chem. Eng., Univ. of Saskatchewan, Saskatoon,

Saskatchewan S7N OWO, Canada). **The pyrolysis of some amine salts of 2,4-dichlorophenoxyacetic acid.** *J. Agr. Food Chem. 22(1): 86-90; 1974.* (9 references)

Amine salts of 2,4-dichlorophenoxyacetic acid (2,4-D) were pyrolyzed at various temperatures. Amide production was first observed at 80° by mass spectroscopy. The fastest rate of formation of the corresponding amide was between 140-150° for the methyl and *n*-butylamine salts, between 150-170° for the *n*-dodecyl and *n*-tetradecylamine salts, and above 160° for the dimethylamine salt. Beyond 160°, 2,4-dichlorophenol, imines, lactones, and other compounds were also formed. The amides appeared to decompose completely above 200°. The activation energy for amide formation was calculated by differential scanning calorimetry (DSC), utilizing a new manipulative technique involving the Boltzmann distribution. The activation energies were found to be (44 ± 1) and (38 ± 3) kcal mol^{-1} for the *n*-butyl and *n*-tetradecyl salts, respectively. The heats of fusion and stoichiometry of the salts were also determined. (Author abstract reprinted by permission of the American Chemical Society)

74-0785. Liu, L. C.; Cibes-Viade, H. R. (Agr. Exp. Station, Mayaguez Campus, Univ. Puerto Rico, Rio Piedras, Puerto Rico). **Adsorption of fluometuron, prometryne, sencor, and 2,4-D by soils.** *J. Agr. Univ. P. R. 57(4): 286-293; 1973.* (24 references)

During a study of herbicide adsorption on 48 different soils collected in Puerto Rico, prometryne was adsorbed the most, followed by fluometuron and sencor with approximately the same percentage adsorbed, and then 2,4-D. High levels of adsorption (7 to 99%) for prometryne could be attributed to the protonated molecular configuration of the herbicide. The low adsorption of 2,4-D could be related to the fact that negatively charged soil colloids tend to repel the negatively charged anionic 2,4-D predominating in the neutral aqueous system. This herbicide has great potential to leach or move away from the site of application. Organic matter was the soil component most highly correlated with adsorption of the herbicides, and cation exchange capacity was also important in the cases of all but 2,4-D.

74-0786. Farb, R.; Moore, B. C. (Dept. Biol., Univ. Alabama, University, AL). **A preliminary investigation of pollution and its distribution in Mobile Bay.** *J. Ala. Acad. Sci. 42(3): 138; 1971.*

The results of laboratory analyses of sediment samples from the Mobile Bay for aldrin, BHC-lindane, chlordane, DDE, DDD (TDE), DDT (*p,p'*), dieldrin, endrin, heptachlor, and methoxychlor are summarized. DDT, DDE, and DDD were found in all samples analyzed and were present in the highest concentrations (0.001 to 0.1 ppm). Although not detected in all samples, aldrin, BHC-lindane, chlordane, dieldrin, endrin, heptachlor, and methoxychlor were found in the range of 0.001 ppm in some areas. At a sampling station on a river that feeds into the upper bay, aldrin was found at a concentration of 0.011 ppm. The concentration of all pesticides detected was highest at this station.

74-0787. Mussman, H. C. (Sci. Tech. Serv., Anim. Plant Health Inspection Serv., U.S.D.A., Washington, DC 20250). **The changing face of meat and poultry inspection.** *J. Amer. Vet. Med. Ass. 163(9): 1061-1064; 1973.*

Residue evaluation is one of the newest functions of the Meat and Poultry Inspection Program, a part of the Animal and Plant Health Inspection Service of the U.S.D.A. At present, determining the extent of a residue problem on a national basis is accomplished through statistical sampling of an animal population. Selective sampling is done on a specific basis if statistical sampling reveals a problem or if other information suggests a potential problem. A central laboratory is being equipped with MS, GC, and other highly sensitive instruments, and this will handle residue determinations except in the event of crisis when the six field laboratories will add support. In 1972, more than 200,000 analyses were conducted on 30,000 tissue samples taken at slaughter.

74-0788. Bothwell, M. L.; Beeton, A. M.; Lech, J. J. (Center of Great Lakes Studies, Univ. Wisconsin, Milwaukee, WI 53201). **Degradation of the lampricide 3-trifluoromethyl-4-nitrophenol by bottom sediments.** *J. Fish. Res. Bd. Can. 30(12): 1841-1846; 1973.* (3 references)

At low oxygen tensions in sediment-water aquaria systems, concentrations of 3-trifluoromethyl-4-nitrophenol (TFM) in the range 5–10 mg/liter were reduced to 3-trifluoromethyl-4-aminophenol (RTFM) in 5–20 days. This reduction resulted in loss of the characteristic yellow color of TFM as measured by the optical density at 395 nm. The reduced form was apparently stable, although inconclusive evidence suggested that some additional breakdown of RTFM may have occurred within 3 months under anoxic conditions. Under aerobic conditions, no significant degradation of TFM was observed for periods of up to 2.5 months. Sorption of TFM by sediments was observed to some extent and appeared to vary with the sediment source. (Author abstract by permission)

74-0789. Ashani, Y.; Snyder, S. L.; Wilson, I. B. (Dept. Chem., Univ. Colorado, Boulder, CO 80302). **Linear free energy relationships in the hydrolysis of some inhibitors of acetylcholinesterase.** *J. Med. Chem. 16(5): 446-450; 1973.* (13 references)

The spontaneous hydrolysis of diethyl phosphates and 1,3,2-dioxaphosphorinane 2-oxides having Cl, F, and *p*-nitrophenol as leaving groups, i.e., including paraoxon,

was investigated in buffers ranging in pH from 7 to 13. The results indicated that hydroxide ion catalysis of both series of compounds follows a linear Bronsted relationship over a p*K*a range from 10 to −7. Data obtained for water reactions was less conclusive. It was suggested that chloro derivatives do not hydrolyze via an SN1 (phosphorylium ion) mechanism. A special property of the enzyme reaction must have been responsible for the sharp break observed previously in a plot of the logarithm of the bimolecular rate constant for the inhibition of eel ChE by diethyl phosphates versus the p*K*a of the leaving group.

74-0790. Barker, P. S.; Vaisey, M. (Canada Dept. Agr., Res. Station, 25 Dafoe Rd., Winnipeg, Manitoba R3T 2M9, Canada). **Effect of storage condition and time on the odor of malathion-treated wheat.** *J. Stored Prod. Res. 9(3): 171-180; 1973.*

Less than two-thirds of a panel of judges were able to detect the odor of premium grade malathion in wheat; however, most were able to detect the odor of technical grade malathion. Those subjects who could detect premium grade malathion did not find the odor obnoxious or easily described. Open storage of treated wheat decreased the incidence of detection and the proportion of judges finding insecticide-treated wheat objectionable, particularly in the case of the technical grade. Brief exposure of wheat (10 min.) to air during storage or prolonged storage (8 wk) did not affect odor detectability or intensity.

74-0791. Kovaleva, Ye. S.; Talanov, G. A. (All-Union Sci. Res. Inst. Vet. Hyg., USSR). **Dinamika ostatkov diazinona, metafosa i trikhlormetafosa-3 v kormovykh kul'turakh. [Residue dynamics of diazinon, methyl parathion, and trichlorometaphos-3 in fodder crops.]** *Khim. Sel. Khoz. 11(4): 274-276; 1973.* (4 references) (Russian)

The residue dynamics of diazinon, methyl parathion, and trichlorometaphos-3 were studied in clover, alfalfa, timothy, sugar beet, potato, corn, vetch, and oats treated with 1.2 kg/ha doses of the respective pesticides. The highest diazinon, methyl parathion, and trichlorometaphos-3 concentrations in plants were 0.4, 2.2, and 12.5 mg/kg, respectively, 10 days after application. Diazinon concentrations of 0.006-0.094 mg/kg over 40 days, methyl parathion concentrations of 0.01-0.014 mg/kg over 50 days, and trichlorometaphos-3 concentrations of 0.05-0.06 mg/kg over 60 days following application were determined in all cultures by gas chromatography. Methyl parathion concentrations of 0.01-0.174 mg/kg were measured in sugar beet peelings, but were not detectable in the flesh of sugar beet and potato. The trichlorometaphos-3 concentrations determined in potato peelings and in peelings and flesh of sugar beet were 0.006-0.16 mg/kg, 0.09-0.48 mg/kg, and 0.004-0.014 mg/kg, respectively. The waiting periods deduced tentatively from the above findings for diazinon, methyl parathion, and trichlorometaphos-3 are 10, 40, and 60 days.

74-0792. Silant'yev, A. N.; Milashchenko, N. Z. (Siberian Sci. Res. Inst. Agr., USSR). **Posledeystviye gerbitsidov proizvodnykh benzoynoy kisloty na yarovuyu pshenitsu v usloviyakh Zapadnoy Sibiri. [Residues of benzoic acid-derived herbicides in spring wheat in Western Siberia.]** *Khim. Sel. Khoz. 11(4): 286-288; 1973.* (8 references) (Russian)

After-effects of 2,3,6-TBA and Banvel-D (dicamba) were studied in spring wheat and bean. These were grown in loamy chernozem with a pH of 6.5 and a humus content of 7.7-8.3% in which corn treated with the above herbicides had been previously grown. The pesticide expenditures in corn fields ranged from 0.12 to 5.4 kg/ha. 2,3,6-TBA reduced wheat crops. Both pesticides are decomposed very slowly in dry soil. Banvel-D is inactivated in the soil 3 to 4 times more rapidly than 2,3,6-TB. Banvel-D used at a dose of 0.95-1.35 kg/ha does not have negative after-effects on subsequently grown spring wheat.

74-0793. Lyubenko, N. Kh.; Sasinovich, L. M.; Zor'yeva, T. D. (All-Union Sci. Res. Inst. Toxicol. Pestic. Polymers Plastics, USSR). **Vliyaniye razlichnykh vidov pererabotki pishchevykh produktov na soderzhaniye v nikh ostatkov fosfororganicheskikh pestitsidov. [Effects of various food processing treatments on organophosphate pesticide residue levels.]** *Khim. Sel. Khoz. 11(6): 439-440; 1973.* (7 references) (Russian)

The effects of home cooking, industrial preparation, and thermal processing treatments on the DDVP (dichlorvos), phencapton, and cidial (phorate) residue levels were studied in vegetable food products. Peeling almost always resulted in complete elimination of the phencapton and cidial residues from fruits. The efficiency of washing ranged from 45 to 80% for apples, pears, cherries, and strawberries. Chopping and homogenization of fruits and berries also proved highly effective for eliminating phencapton, cidial, and DDVP residues. Sterilization, a step in fruit canning, was highly effective for phencapton, but less effective for cidial whose elimination was possible by boiling. Storage of fruits at ambient and 4°C temperatures for 2-8 weeks was sufficient for the elimination of phencapton and cidial residues, respectively. Grain free from DDVP absorbed 0.12 to 0.25 mg/kg during milling on a DDVP-treated mill. The DDVP content in grain introduced into a DDVP-treated storage facility five days after treatment amounted to 0.24 mg/kg. Milling, and especially baking of milled products, resulted in quantitative elimination of the DDVP residues.

74-0794. Ivanova, Ye. P.; Nekrasova, A. S.; Bakanov, Sh. A.; Mayorova, R. I. (Kazan Sci. Res. Inst. Potato and

Vegetable Prod., Kazan, USSR). **Effektivnost' prometrina protiv sornyakov na posevakh morkovi i ostatki yego v urozhaye i pochve. [The efficacy of prometryne for weed control in carrot cultivation and its residues occurring in the crop and soil.]** *Khim. Sel. Khoz. 11(7): 541-543; 1973.* (2 references) (Russian)

The efficacy of prometryne for weed control in carrot cultivation, and prometryne residues occurring in crops and soil at different times after treatment with 1.5, 2, 2.5, and 3.5 kg/ha doses were studied. Thin-layer chromatography was used for determining prometryne residues. The prometryne residues determined in carrot roots 2 months after application of 1.5 kg/ha and 2 kg/ha doses were 0.22-0.27 and 0.31-0.34 mg/kg, those in carrot leaves 0.08-0.11 mg/kg, and those in the soil 0.22 mg/kg, respectively. Prometryne residues were not detected in roots, leaves, and soil samples 4 months after treatment. The prometryne residues determined in carrot roots and leaves 3 months after application of 2.5 and 3.5 kg/ha doses were 0.01-0.02 and 0.03-0.05 mg/kg and 0.02-0.03 and 0.02-0.03 mg/kg, respectively. Traces of prometryne were detected in roots and leaves even at harvesting, i.e., about 6 months after herbicide application.

74-0795. Kuz'min, I. A. (Inst. Sylvicult., Karelian Branch Acad. Sci. USSR, USSR). **Prodolzhitel'nost' sokhraneniya gerbitsidov v vozdushno-sukhoy pochve, khranivsheysya v laboratornykh usloviyakh. [Herbicide persistence in air-dried soil samples stored under laboratory conditions.]** *Khim. Sel. Khoz. 11(7): 543-545; 1973.* (3 references) (Russian)

The biological inactivation and the degradation of dalapon and trichloroacetate in biological soil cultures and in air-dried soil samples stored under laboratory conditions were studied. The inactivation studies of dalapon and trichloroacetate used barley as test plants and growth inhibition as indicator. Trichloroacetate became inactivated in 8 to 10 weeks in sandy soils and in 7 weeks in soil samples with 10.54 and 1.14% humus and 10.18% loam; dalapon became inactivated in 2 to 3 weeks in the same soils. The toxic effects of dalapon and trichloroacetate slightly decreased after storage under laboratory conditions (moisture content 20-25%, soil temperature 18-20°C) for three years.

74-0796. Umarov, A. A.; Loy, N. P.; Tsoy, Z. I. (Inst. Chem. Plant Materials, Acad. Sci. Uzbek SSR, USSR). **Detoksikatsiya i peredvizheniye gerbitsida 5KhIB v pochve. [Decontamination and movement of 5-KhIB (5-chloro-*N*-isopropenylbenzimidazolone) in soil.]** *Khim. Sel. Khoz. 11(7): 545-547; 1973.* (4 references) (Russian)

Decontamination and movement of 5KhIB (5-chloro-*N*-isopropenylbenzimidazolone) in the soil were studied in laboratory tests. Judging from the growth inhibition of test plants, the herbicide became inactivated in the soil in 2 to 5 months. Compared to surface application, introduction into the soil increased persistence as did increased doses of 5 and 10 kg/ha. High soil moisture content slowed down the inactivation process. Leachout from the soil was slow. The bulk of the pesticide is retained within the upper 5 cm layer of the soil.

74-0797. Pokidov, I. I.; Talanov, G. A. (All-Union Sci. Res. Inst. Sheep and Goat Breeding, USSR). **Soderzhaniye ostatkov TKhM-3 v organakh i tkanyakh ovets. [TCM-3 residue levels occurring in sheep organs and tissues.]** *Khim. Sel. Khoz. 11(7): 649-651; 1973.* (Russian)

TCM-3 (trichlorometaphos-3) residue levels were determined in organs and tissues of sheep by chromatography at different times after bathing and spraying of sheep with TCM-3. TCM-3 residues persisted in skeletal and cardiac muscles, liver, kidney, lung, brain, and wool of sheep for 60 days after they were treated with 0.25% emulsion of TCM-3. The residue levels were usually low, not exceeding 0.2 mg/kg. The highest TCM-3 residue levels, determined in organs of sheep sacrificed 10 and 60 days after treatment, were 0.4 and 0.065 mg/kg, respectively. Residues were rapidly eliminated from the spleen and lymph nodes. The TCM-3 residue levels were essentially similar in the different organs investigated. The TCM-3 in wool ranged from 132 to 2,580 mg/kg 13 days after treatment. TCM-3 residue levels of the organs and tissues and of the wool were correlated.

74-0798. Ohlsson, I.; Svensson, A. (Institutionen for Vaextodling, Uppsala, Sweden). **Rester av diquat efter bladdoedning i vaerraps. [Residues of diquat in seeds of spring rape after desiccation.]** *Lantbrukshoegsk. Medd. Ser. A 191: 1-17; 1973.* (19 references) (Swedish)

Following desiccation of spring rape leaves with diquat at 0.6 kg/ha, diquat residues were detected in all rape seeds, the analytical limit being 0.1 ppm. The diquat residues found in the spring rape seeds ranged from 0.2 to 4.0 ppm. Diquat residues in seeds decreased with maturity. After desiccation in crop stands which were considered as very unripe, the seeds contained 1.3 to 4.0 ppm of diquat; desiccation in ripe stands gave only 0.2-0.3 ppm diquat in the seeds. Both the chlorophyll and free fatty acid contents were positively correlated with the diquat content; the thousand kernel weight and germination capacity were negatively correlated with the diquat residue level. Diquat residue level and the crude fat content were not related.

74-0799. Takase, I.; Nakamura, H.; Kobayashi, M.; Tsuboi, A.; Wakabayashi, S. (Agr. Chem. Res. Inst., Nihon Tokushu-Noyaku Seizo Co. Ltd., Hino, Tokyo, Japan). **[On the fate of disulfoton in the paddy field soil.]** *Noyaku Kenkyu (Agr. Chem. Res.) 19(3): 58-64; 1973.* (Japanese)

Experiments were carried out in pots of soil under flooded conditions and in paddy fields to study the fate of disulfoton, applied to soil. Residues of disulfoton in unpolished rice and rice straw harvested in the field were also determined. In the potted and flooded soil all the chemical from 4 mg of disulfoton applied as a diluted solution of 25 % EC diminished quickly, the half-life at 25-30°C being about four days. A large part of disulfoton applied on the surface of flooded paddy fields diminished quickly through oxidation, hydrolyzation, photodegradation, and evaporation. Some disulfoton was adsorbed in the soil where it decomposed relatively slowly. Disulfoton was eventually oxidized in water and soil with time; the major oxidative metabolite detected was its sulfoxide. When 5 % granular formulation was applied on the water surface of flooded paddy field at the rate of 6 kg/10 are, the chemical diminished quickly with a half-life of 3-4 days, and the major oxidized metabolite being the sulfoxide. In the unpolished rice harvested from the paddy field where disulfoton had been applied once at a rate of 6 kg of 5 % granular formulation/10 are neither disulfoton nor its oxidative metabolites were detected 120-140 days after application. In rice straw simultaneously harvested about 0.25 ppm of oxidative metabolites were detected.

74-0800. Solly, S. R. B.; Harrison, D. L. (Wallaceville Anim. Res. Cent., Min. of Agr. and Fisheries, Wellington, New Zealand). **DDT in some New Zealand marine and freshwater fauna.** *N. Z. J. Mar. Freshwater Res. 6(4): 456-462; 1972.* (10 references)

Ten species of fish, crustaceans, and molluscs taken from island and coastal waters off New Zealand between 1969 and 1970 (primarily before the legislative ban on DDT) were analyzed for lindane, polychlorinated biphenyls (PCB), and DDT residues and metabolites. The DDT levels in edible tissue ranged from 0 to 0.20 ppm, being well within national and international tolerance limits. DDE was the only organochlorine compound detected in six species and was the major residue component in three others; DDD (TDE) and/or DDT were found only in eels, groper, and some flounders. Lindane or PCB-like compounds were not detected in any species. The low residue levels found in oysters and mussels indicate that the concentration of DDT and related compounds in New Zealand coastal waters is extremely low. In general, there was little correlation between residue levels and the regional usage of DDT.

74-0801. Urban, S.; Schifferli, A. (Achilles-Bischoff-Strasse 2, 4000 Basel, Switzerland). **Untersuchungen ueber die Auswirkung von Pestizidverschmutzung auf Voegel im suedlichen Ungarn. [Studies on the effect of pesticide pollution on the birds in southern Hungary.]** *Ornithol. Beob. 70(1): 1-18; 1973.* (33 references) (German)

Organochlorine pesticide residues were determined by TLC in brains, livers, kidneys, muscles, body fat, and egg yolks from specimens of *Ardea cinerea, A. purpurea, Nycticorax nycticorax, Larus ridibundus, Corvus corone cornix, Corvus frugilegus, Anas platyrhynchos, Aythya ferina, Perdrix perdrix, Phasianus colchicus, Fulica atra, Numenius arquata, Limosa limosa, Philomachus pugnax,* and *Streptopelia decaocto,* from southern Hungary near Szeged. The differences in the organochlorine pesticide residue levels were considerable, not only between species and age groups, but also between individuals of the same species. The levels ranged from 87.92 ppm in adult *A. cinerea* to 2.09 ppm in adult *F. atra.* The differences in egg yolks were somewhat smaller, with a maximum of 20.78 ppm in *C. frugilegus* and a minimum of 2.13 ppm in *F. atra.* The methoxychlor, BHC, DDT, and DDE residue levels in egg yolks of *A. purpurea* were 0.41, 1.15, 1.87, and 15.94 ppm. The total organochlorine pesticide residue levels in egg yolks of *L. ridibundus, A. ferina, F. atra, C. frugilegus, Phasianus colchicus,* and *P. perdrix* were 13.46, 4.60, 2.13, 20.78, 7.50, and 4.40 ppm, respectively. Birds of prey showed generally higher levels than plant feeders. *A. cinerea* and *Corvus* species, as well as their eggs, seem to be the best indicators of pesticide contamination in inland areas. Birds are considered to be more convenient indicators than mammals which have a smaller home range.

74-0802. Paitier, G. (Service de la Protection des Vegetaux, France). **Mise au point d'une methode de lutte contre les maladies de la laitue cultivee en serre en vue de limiter les residus de pesticides. [Refined method to limit pesticide residues for controlling diseases of greenhouse lettuce.]** *Phytoma 25(246): 19-29; 1973.* (French)

Quintozene and dichloran were applied to soil to control *Sclerotinia sclerotiorum* and *S. minor,* and zineb, mancozeb, thiram, and benomyl were applied to greenhouse lettuce to control *Bremia lactuae* and *Botrytis cinerea.* During these tests efforts were made to refine a plant protection method to limit pesticide residues. Quintozene (PCNB), applied to the soil at a rate of 15 kg/ha, left residues of 0.16-0.64 ppm in lettuce, against a maximum allowable concentration of 1 ppm. Zineb at 3.2 g/m^2 and thiram at 0.2 g/m^2, should not be applied to lettuce later than 7 weeks before harvesting to maintain residues under 3 ppm. Dicloran is not recommended for use on lettuce. Negligible traces of benomyl were detected in lettuce after treatment at a rate of 0.8 kg of benomyl per ha. The pesticide residue levels in harvested lettuce are essentially determined by the date of the last treatment and the dose applied at that time.

74-0803. Herzel, F. (Author address not given). **Pflanzenschutzmittel als Beispiel nichtlokalisierbarer Gewaesserbelastungen. [Herbicides as an example of water pollutants whose source cannot be located.]** *Schriftenr.*

Ver. Wasser- Boden- Lufthyg. (Berlin-Dahlem) 38: 147-154; 1972. (1 reference) (German)

Possible routes of herbicides into surface water bodies and results of BHC, lindane, heptachlor, aldrin, heptachlor epoxide, DDE, DDT, endosulfan, dieldrin, and parathion concentration determinations are described. Pesticides in surface water bodies in Germany may originate in farmlands previously treated with such preparations or be discharged from chemical manufacturing plants. The discharge and the control of aquatic plants by herbicides are usually responsible for higher water concentrations of herbicides than that from contamination from farmlands. Massive fish death due to the discharge of large quantities of pesticides has resulted. Pesticide residue measurements in water, suspended matter, and benthic sediment samples taken from major surface water bodies showed fairly low pesticide concentrations, usually only in the ng range, with a few readings in the μg range. No pronounced seasonal variation in the pesticide concentrations was evidenced. Both the number of contaminated benthic sediment samples and the residue levels in such samples were relatively low.

74-0804. Bidleman, T. F.; Olney, C. E. (Dept. Food and Resource Chem., Univ. Rhode Island, Kingston, RI 02881). **Chlorinated hydrocarbons in the Sargasso Sea atmosphere and surface water.** *Science 183(4123): 516-518; 1974.* (18 references)

Polychlorinated biphenyls (PCB), DDT, and chlordane concentrations were measured in air sampled from a tower on the south shore of Bermuda and in Sargasso Sea surface water approximately 80 to 320 kilometers south of Bermuda. The atmospheric chlorinated hydrocarbons appeared to be gaseous, and the DDT concentration was two orders of magnitude higher than previously reported particulate values. The PCB and DDT were enriched in the surface microlayer (150 micrometers) relative to their concentrations in water at a depth of 30 centimeters. Atmospheric residence times for PCB and DDT of 40 to 50 days, calculated from the concentrations in the air and water, are 20 times shorter than values previously estimated for DDT from rainfall and DDT production data. (Author abstract by permission. Copyright 1974 by the American Association for the Advancement of Science)

74-0805. Kawai, Y.; Hori, Y.; Nigawa, Y.; Yamamoto, I.; Tsuzuki, T.; Kitayama, M.; Mori, K. (Research Inst. of Hygiene-Hokkaido, Sapporo, Japan). **[On the pollution of mothers' milk by pesticides and PCB in Hokkaido.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 14(3): 302-303; 1973.* (Japanese)

The pollution of mothers' milk by pesticides and PCBs in Hokkaido was examined using 20 samples obtained in Ebetsu in Feb. 1971, 29 obtained in Ebetsu and three other cities and towns in Jan. 1972, 30 obtained in Muroran and five other cities and towns in July 1972, and 44 obtained in Sapporo and another city May-Aug. 1972. The contents of β-BHC and total DDT in whole milk on the average in the first, second, third, and the fourth group were respectively 0.032 and 0.078, 0.040 and 0.108, 0.054 and 0.133, and 0.049 and 0.100 ppm.

74-0806. Noguchi, T.; Tsuji, I.; Matsubara, K. (Kumamoto Prefect. Inst. Hyg. and Environ. Pollution Research, Kumamoto, Japan). **[Photochemical degradation products of polychlorocyclodiene pesticides; their translocation and persistence in fatty foods.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 14(3): 305; 1973.* (Japanese)

Solutions of recrystallized dieldrin, aldrin, and endrin in *n*-hexane were irradiated under UV light at 2536 A for a predetermined time and the products of each of the dienes examined by GC and TLC. Each product was isolated and treated by GC. A similar cleanup procedure was performed on extracts from fatty foods spiked with pesticide residues, and the results were compared with the gas chromatograms of the photolysis products. Six photodecomposition products were recognized by GC and TLC: two from dieldrin, three from aldrin, and one from endrin. After examining the translocation and persistence of these products, it was found that one of the degradation products of dieldrin, which showed a retention time of 0.77 on a column of D(200+EPON 1001 (2:2.2 %)) and 0.93 on a column of 2 % QF-1 relative to dieldrin, was recognized in muscle of poultry and fish, eggs, and human milk.

74-0807. Kanematsu, H.; Tomomi, K.; Maruyama, T.; Shintani, I.; Imamura, M.; Oshiba, K.; Kawakita, H. (Japan Ass. of Examination on Foods and Fats and Osaka Municipal Res. Inst. of Hygiene, Osaka, Japan). **[Effectiveness of removal of organochlorine pesticide residues from edible fats in the process of their purification and processing.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 14(3): 305-306; 1973.* (Japanese)

Information was obtained on the behavior of organochlorine pesticide residues in crude animal and vegetable oils, purified and processed. The residue reducing capacities of the processes were also studied. Eight samples of animal oils, nine of vegetables, eight of hydrogenated animal oils, and five of hydrogenated vegetable oils were used. Determination of organochlorine pesticides depended on gas chromatography with ECD and included α-, β-, γ-, and δ-BHC, dieldrin, aldrin, endrin, and four compounds related to DDT. Pesticide residues in crude oils were somewhat higher in animal than in vegetable oils and were moderately higher in those from marine animals such as fish and whale oils. Aldrin and endrin were not detected in all specimens. Deacidifying and decolorization had few effects on residue levels. Both hydrogenation and deodorization reduced residues. Oils first hydrogenated and then

deodorized were free of pesticides. More DDT and polychlorocyclodiene residues were reduced than BHC. However, after all processing, BHC, especially the δ-isomer, could scarcely be detected except in hydrogenated oils in which a minute amount of BHC remained.

74-0808. Biggar, J. W.; Cheung, M. W. (Dept. Water Sci. and Engineering, Univ. California, Davis, CA 95616). **Adsorption of picloram (4-amino-3,5,6-trichloropicolinic acid) on Panoche, Ephrata, and Palouse soils: a thermodynamic approach to the adsorption mechanism.** *Soil Sci. Soc. Amer. Proc. 37(6): 863-868; 1973.* (26 references)

The adsorption of picloram was studied on Panoche clay loam (at pH 4.2 and 1.2), Ephrata sandy loam, and Palouse silty loam. The adsorption processes could be described by the Freundlich equation with Freundlich constants, K $1/n$, and percentage of adsorption at 25°C: respectively, 0.210, 0.92, and 3-5.6% for Panoche at pH 4.2; 2.5, 0.93, and 30% for Panoche at pH 1.2; 0.172, 0.99, and 1.9-3.6% for Ephrata; and 1.74, 0.92, and 26-33% for Palouse. Also evaluated were the standard free energy, entropy, and enthalpy associated with the adsorption processes. The values of ΔG° (kcal/mol), ΔS° (cal/mol per degree), and ΔH° (kcal/mol) were: respectively, -1.2 ± 0.1, -14 ± 2, and -5.3 ± 0.6 for Panoche at pH 4.2; -2.98 ± 0.05, -59 ± 2, and -20 ± 1 for Panoche at pH 1.2; -1.80 ± 0.06, -24 ± 3, and -9 ± 1 for Ephrata; and -3.11 ± 0.05, -3.3 ± 1.5, and -4.1 ± 0.4 for Palouse. Thermodynamic parameters were useful in assigning adsorption mechanisms to the four picloram-adsorbent-water systems. (Author abstract by permission)

74-0809. Swanson, R. A.; Dutt, G. R. (Dept. Soils, Water, and Engineering, Univ. Arizona, Tucson, AZ 87521). **Chemical and physical processes that affect atrazine and distribution in soil systems.** *Soil Sci. Soc. Amer. Proc. 37(6): 872-876; 1973.* (15 references)

Interactions studied included adsorption and desorption of atrazine by Ca^{2+}, Mg^{2+}, and Na^{+} saturated soil material and the effect of chloride salts of the above cations on solubility of crystalline atrazine. It was found that adsorption isotherms follow the Freundlich equation. The desorption isotherm had the same shape as the adsorption isotherm but followed a different path back to the starting point. This hysteresis effect encountered indicates that adsorption and desorption of atrazine are irreversible reactions. The desorption isotherm was found to fit the Freundlich equation where the exponential desorption coefficient was equal to the exponential adsorption coefficient divided by 2.3. The effect of exchangeable cations was found to be within experimental error, and the solubility of crystalline atrazine was found to be exponentially related to the ionic strength of the solution. Using the equation developed, a computerized model for predicting atrazine distribution and movement in soil systems was prepared. Predicted breakthrough and elution curves were in agreement with those found for effluents from soil columns. It was concluded that the skewed nature of the experimental curve was primarily due to differences in the adsorption and desorption of atrazine. (Author abstract by permission)

74-0810. Scott, H. D.; Phillips, R. E. (Dept. Agron., Univ. Arkansas, Fayetteville, AR). **Self-diffusion coefficients of selected herbicides in water and estimates of their transmission factors in soil.** *Soil Sci. Soc. Amer. Proc. 37(6): 965-967; 1973.* (11 references)

Self-diffusion coefficients of selected herbicides were measured in aqueous solution by the capillary tube method. The diffusion coefficients were approximately 0.6×10^{-5} cm^2/sec at 23°C and were not particularly related to the configuration of the herbicide molecule. Values calculated for the transmission factors of these herbicides differed with the more mobile compounds being associated with the higher values. (Author abstract by permission)

74-0811. LaFleur, K. S. (Clemson Univ., Clemson, SC). **Fluometuron-soil-solvent interactions.** *Soil Sci. 116(5): 376-382; 1973.* (36 references)

In 3 types of soil, Cecil B_2t, Cecil A, and Cecil B_2t + Ti-Ti peat, desorption of fluometuron was greatest by CH_3CN and C_2H_5OH and least by n-C_6H_{14}, while in Cecil B_2t + Norit A, the desorption was highest by CH_2Cl_2 and zero by water. Cecil B_2t had the lowest affinity for the herbicide and Norit A the highest. Greater desorption occurred when Norfolk B_2t soil was substituted for Cecil B_2t soil. An approximately linear response was obtained in the presence of an "infinite" number of soil sites and an "infinite" number of solvent sites. At low solute concentrations, the direction of approach to equilibrium affected the equilibrium position. At higher concentrations, where the response was hyperbolic (Langmuir-type), the "monolayer limit" was 4.0 mmol/kg for Cecil B_2t soil and dichloromethane.

74-0812. Yamagishi, T.; Takeba, K.; Fujimoto, C.; Morimoto, K.; Haruta, M. (Tokyo Metropolitan Pub. Health Res. Lab. Tokyo, Japan). **[On the organochlorine pesticide residues in mother's body and her fetus' body.]** *Tokyo-To Eisei-Kyoku Gakkai-Shi (Rep. Tokyo Publ. Health Stud.) 50: 44-45; 1972.* (4 references) (Japanese)

Organochlorine pesticide residues were determined in mother, fetus, and baby in March-June and June-Oct. 1971. Residues in colostrum (whole milk base) were α-BHC 0.001, β-BHC 0.021, γ-BHC 0.003, total BHC 0.025, p,p'-DDE 0.023, p,p'-DDT 0.007, total DDT 0.030, and dieldrin 0.007. Residues of the above pesticides in the meconium were 0.002, 0.021, 0.005, 0.030, 0.009, 0.012, 0.021, and 0.009 ppm. In the second investigation levels in the mothers' blood were 0.0044, 0.105, 0.0042, 0.0191, 0.0082, 0.0011, 0.0093, and

0.0030 ppm. Levels in the blood of the umbilical cord were 0.0033, 0.0072, 0.0028, 0.0133, 0.0023, 0.00003, 0.0023, and 0.00003 ppm. Levels in milk (whole milk base) were 0.001, 0.035, 0.005, 0.041, 0.028, 0.014, 0.044, and 0.002 ppm.

74-0813. Suzuki, J.; Tomomatsu, T.; Kanmuri, M.; Oshida, K.; Katakura, E.; Kimura, Y. (Dept. Food Hyg. Nutr., Tokyo Metrop. Res. Lab. Pub. Health, Tokyo, Japan). **[Determination of biphenyl in citrus fruits by thin layer chromatography. Part 1. Market investigation and recovery of biphenyl on silica gel plate for chromatography.]** *Tokyo-Toritsu Eisei Kenkyusho Kenkyu Nenpo (Annu. Rep. Tokyo Metrop. Res. Lab. Pub. Health) 23: 231-235; 1971.* (13 references) (Japanese)

A method for thin-layer chromatographic determination of biphenyl in citrus fruits was developed and applied to oranges, lemons, and grapefruits imported to Japan from the U.S. The spots, scraped from the TLC plates, were eluted with cyclohexane and the absorbance read at 248 nm. The cleanup procedure affected the biphenyl contents determined: recovery of biphenyl was greater from single-spot than from band-spot plates. The difference was attributed to the effect of the silica gel contents in the elution mixture. Biphenyl contents of the citrus specimens examined were 5-65 ppm; none of the samples exceeded the level established by regulation. (From author summary)

74-0814. Doguchi, M.; Ushio, F.; Abe, M. (Dept. Food Hyg. Nutrition, Tokyo Metrop. Res. Lab. Pub. Health, Tokyo, Japan). **[Polychlorinated biphenyls in fish and birds captured in Tokyo Bay and its surrounding area.]** *Tokyo-Toritsu Eisei Kenkyusho Nenpo (Annu. Rep. Tokyo Metrop. Res. Lab. Pub. Health) 23: 271-276; 1971.* (16 references) (Japanese)

PCB and organochlorine pesticide levels were determined in fish and birds captured in Tokyo Bay and its surroundings in 1971. Similar measurements were performed in fish caught in Suruga Bay for comparison. Grey mullet, perch, sardine, and satsupa from Tokyo Bay had relatively high PCB concentrations in muscle (1-10 ppm). Yellow-tail and akamutu from Suruga bay demonstrated similar concentrations. PCB levels varied greatly among bird specimens. One egret with 180 ppm PCB in muscle also contained large amounts of BHC. In little egret and black-tail gull PCB levels were much higher than levels of organochlorine insecticides. Total BHC levels in little egret muscle samples ranged from 0.70 to 18.21 ppm; total DDT from 0.97 to 8.88 ppm; dieldrin was detectable in trace amounts in some samples. Liver and muscle of black-tailed gulls contained ca. 0.16 ppm total BHC, 0.9 ppm total DDT, and traces of dieldrin.

74-0815. Holt, R. F. (Univ. Minnesota, Morris, MN). **Surface water quality is influenced by agricultural practices.** *Trans. ASAE (Amer. Soc. Agr. Eng.) 16(3): 565-568; 1973.* (34 references)

The impact of agriculture on water quality depends to a large degree on the practice of soil conservation since soil is the primary recipient of fertilizers, animal wastes, and pesticides. Most pesticides have a strong affinity for soil, and many persist in the environment. The approximate half-life for pesticides in soil has been suggested to be 1-2 yr for the triazines, 2-4 yr for the organochlorines, and up to 30 yr for the heavy metals. Losses of substances like dieldrin due to runoff occur primarily during the year of application, but these are only a small portion of the total loss. Anaerobic conditions such as are found in runoff enhance degradation of DDT. Highly selective chemicals of low persistence should, however, be developed in order to ensure a reduction in the hazards of water pollution from agricultural land drainage.

74-0816. Frere, M. H. (Water Quality Management Lab., ARS, USDA, Durant, OK). **Adsorption and transport of agricultural chemicals in watersheds.** *Trans. ASAE (Amer. Soc. Agr. Eng.) 16(3): 569-572; 1973.* (19 references)

A model describes the pathways of chemicals in the soil-water-plant system important to their movement in watersheds. Method of application, adsorption, degradation, and volatilization affect the pathway of the chemical, while hydrologic factors control the speed of movement and amount of chemical moved. Interactions involved have been illustrated in a hypothetical example.

74-0817. Armstrong, D. E.; Weimer, W. C. (Water Chem. Program, Univ. Wisconsin, Madison, WI). **Storage and cycling of pollutants in water bodies.** *Trans. ASAE (Amer. Soc. Agr. Eng.) 16(3): 573-577; 1973.* (27 references)

Storage and cycling of pollutants in a lake depends on residence time of the water, circulation and mixing, and chemical, physical, and biological characteristics of the pollutant. A chemical may be distributed primarily in the dissolved compartment, in the living particulate compartment, or in the non-living particulate compartment. DDT illustrates some of the important aspects of pesticide storage and cycling, but relationships which apply to DDT cannot be extended directly to other compounds. Due to its low solubility, DDT tends to associate with particulate material. Aquatic organisms may accumulate the pesticide through ingestion or direct contact with DDT-containing water and concentrate it in the fat. Transport to anaerobic zones results in a relatively rapid metabolism to DDD (TDE), while incorporation into aerobic aquatic organisms results in partial metabolism to the more stable DDE. The reversible sorption of mercury on bottom sediments and its conversion to methyl mercury by microorganisms also illustrate the importance of specific factors associated with the pollutant in its storage and cycling in lake water.

74-0818. Bauer, U. (Inst. fuer Wasserforschung GmbH, Dortmund, Germany). **Das Verhalten von einigen Herbiziden und Insektiziden bei der Aufbereitung von Oberflaechenwasser zu Trinkwasser. [The behavior of some herbicides and insecticides during purification of surface water for drinking.]** *Vom Wasser 39: 161-187; 1972.* (44 references) (German)

The efficiency of various methods such as chlorination, ozonization, potassium permanganate treatment, flocculation with filtration, and treatment with activated carbon powder for obtaining drinking water from surface water was studied. Elimination of diuron, linuron, alpha-BHC, lindane, heptachlor, aldrin, isobenzan, heptachlor epoxide, endosulfan, dieldrin, *p,p'*-DDD, *o,p'*-DDT, *p,p'*-DDT, methoxychlor, malathion, dimethoate, 1,2,4,5-tetrachlorobenzene, and BHC residues from surface waters was also considered. Chlorination is highly effective in eliminating aldrin, atrazine, dichloralurea, sodium trichloroacetate, parathion, propazine, pyramine, simazine, and trichloroprop onitrile; flocculation is highly effective for aldrin, dieldrin, DDT, and lindane; activated carbon is highly effective for apolar pesticides. Other experiments showed potassium permanganate treatment effective for eliminating heptachlor, aldrin, endosulfan, and *o,p'*-DDT; chlorination useful for malathion, dimethoate, diuron, and aldrin; and ozonization good for heptachlor, aldrin, heptachlor epoxide, endosulfan, dieldrin, TDE, and methoxychlor.

74-0819. Tovstenko, A. I. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, Plastic Materials, Lab. Hyg. Toxicol. Fungicides, Nematocides and Zoocides, Kiev, USSR). **Gigiyenicheskaya otsenka ostatochnykh kolichestv fungitsida karpena (dodetsilguanidinatsetata) v yablokakh. [Hygienic evaluation of residual amounts of the fungicide carpene (dodecylguanidine acetate) in apples.]** *Vop. Pitan. 5: 72-74, 96; 1973.* (10 references) (Russian)

A complex hygienic and toxicologic study was performed with carpene (dodine), a cationic fungicide. Carpene is slightly toxic in rats (LD50 = 1,1118 mg/kg), moderately toxic in rabbits and mice (LD50 = 535 and 266 mg/kg, respectively), highly toxic in guinea pigs (LD50 = 176 mg/kg), and moderately cumulative (for daily administration of 1/20 LD50, the cumulation factor is 4.0 in guinea pigs and 5.4 in mice). A threshold dose of 1.33 mg/kg and a no effect dose of 0.67 mg/kg were found in chronic tests. Doses of 1.33 mg/kg caused functional changes in the cerebral cortex and hemodynamic changes in the heart, liver, kidney, brain, and lung in guinea pigs. The carpene residues in treated apples dropped to 0.59 mg/kg in 10 days, further to 0.202 mg/kg in 20 days, and to 0.04-0.08 mg/kg in 75 days after treatment. Heat treatment (pasteurization) was found to be an effective means of reducing the residual amounts of carpene in food products such as apple juice and stewed apples. The recommended maximum allowable concentration of carpen in fresh fruits is 0.6 mg/kg. The waiting period after the treatment of apples trees is recommended to be set at 20 days, maximum. The tolerance in apples is recommended to be 0.27 mg/kg.

74-0820. Davies, J. E. (Div. Family Med., Univ. Miami, Miami, FL). **The role of house dust in human DDT pollution.** *West Indian Med. J. 21(3): 172; 1972.*

In a survey of 254 residents of an isolated island in the Caribbean serum DDT levels averaged 117 ppb, almost twice as high as those obtained in Dade County, Florida. Only trace amounts of the pesticide were found in food, air, and water on the island, but from 15 homes the average concentration of total DDT in house dust was 129 ppm. House dust was apparently the main source of DDT pollution in humans on the island. Inhalation may have been a contributing factor since air collected from the interior of a home after sweeping contained traces of DDT in particles of a 0.3 micron size. Almost 50% of the residents interviewed favored the use of a 5% DDT spray for control of roaches and flies. No obvious ill effects were observed with the high serum levels of DDT.

See also 74-0831 74-0834 74-0856 74-0888 74-0942 74-0976 74-0998 74-1001

74-0821. Chang, L. W.; Opitz, J. M.; Pallister, P. D.; Gilbert, E. F.; Viseskul, C. (Dept. Pathol., Univ. Wisconsin, Madison, WI). **Minamata disease: a case report and a comparative study.** *Acta Neuropathol. 26(4): 275-284; 1973.* (4 references)

A case of suspected mercury intoxication in a previously normal 3-year-old girl was studied by light and electron microscopy and results compared to confirmed cases of Minamata disease. The onset of clinical manifestations of a central nervous system degenerative disease followed, in retrospect, an episode in which the child might have ingested a mercury containing insecticide used for the control of root beetle infestations of domestic vegetables. Postmortem examination revealed disintegration of the granular layer of the cerebellum, disappearance of the Purkinje cells with Bergmann's fiber proliferation, and demyelination of the cerebellar fiber tracts. Ultrastructural examination also revealed extensive proliferation of astrocytic fibers and characteristic focal demyelination and loosening of the myelin sheaths in many nerve fibers, similar to those from victims of Minamata disease and those from experimental animals poisoned with methyl mercury. Pathological lesions similar to those observed in inorganic mercury intoxication were also observed. The value of characteristic pathological changes as diagnostic criteria in patients with suspected Minamata disease was determined.

74-0822. Anonymous. **Chemicals–handle with care.** *Agr. N. Ir. 48(6): 191; 1973.*

Modern farming techniques rely on the use of a wide range of chemicals, many of which are potentially dangerous. Instructions on the containers in which the chemicals arrive should be read and strictly followed. The chemicals should never be transferred to other containers, and empty containers should be destroyed or rendered harmless. All chemicals should be stored in a safe place and should not be given away, particularly in unlabeled containers. Failure to follow these safety measures could lead to injuries or deaths of animals and humans on the farm and/or nearby communities.

74-0823. Gordon, W. J. (Ministry's Farm Safety Sect., Magnet House, Belfast, Ireland BT15 1AD). **Personal protective clothing and equipment.** *Agr. N. Ir. 48(6): 217-220; 1973.*

Protective clothing and equipment to be used by farm workers are discussed. Head protection may involve the use of safety helmets or coverings providing protection against chemicals such as pesticides; if toxic materials are being used, a waterproof head covering is necessary. Protective equipment for the eyes and face consists of goggles, eye shields, and face shields or screens. Respiratory protective equipment can be divided into three main categories: dust masks, respirators, and breathing apparatus. All should be used when mixing, handling, or applying chemical pesticides or herbicides. In addition, various types of gloves affording hand and arm protection and standard rubber boots affording foot and leg protection are advisable. The use of equipment for ear protection and of safety belts and harnesses is also discussed. Instructions should be given to everyone in farming regarding the purpose, use, and limitations of the various articles of protective equipment.

744-0824. Black, J. R.; Garcia-Mullin, R.; Good, E.; Brown, S. (3400 Spruce St., Philadelphia, PA 19104). **Muscle rigidity in a newborn due to continuous peripheral nerve hyperactivity.** *Arch. Neurol. 27: 413-425; 1972.* (53 references)

Elevated levels of DDE (46.06 ppb) were found in the plasma of an infant with peripheral nerve hyperactivity. The DDT level fell in the normal range for infants at this hospital, and no 2,4-D or parathion was found in the plasma. Although a cause and effect relationship could not be established, the plasma DDE level indicated chronic exposure of the fetus to DDT. The syndrome was similar to that observed in 16 other patients with muscle rigidity but it was distinguished from tetany and myotonia by several features. The infant died at age 33 days.

74-0825. Ochiulet, I.; Ochiulet, I. (Hopital Unifie de Caransebes, Caransebes, Rumania). **Considerations sur l'intoxication par substances organophosphoriques chez l'enfant. [Considerations on poisoning by organophosphorus substances in children.]** *Arch. Union Med. Balkan. 9(3): 304; 1971.*

Accidental poisoning with organophosphorus pesticides in humans, especially children, is reviewed. Poisonings with organophosphorus compounds result ultimately in endogenous acetylcholinesterase inhibition with muscarinic and nicotinic manifestations, and a direct action on the central nervous system. Miosis, bronchorrhea, muscular contraction, and possibly coma are clinical symptoms indicative of poisoning. The effectiveness of atropine, pralidoxime, and obidoxime is stressed.

74-0826. Heuse, A. (Ecole San. Pub., Fac. Med., Univ. Libre de Bruxelles, Brussels, Belgium). **Les insecticides organo-phosphores: un danger de la production a l'utilisation. [Organophosphorus insecticides: danger in production and utilization.]** *Bruxelles-Med. 50: 265-269; 1970.* (French)

The mechanism of action and poisoning symptoms of organophosphorus insecticides are surveyed. Organophosphorus insecticides irreversibly inhibit the cholinesterase activity through phosphorylating the cholinesterase molecules and blocking certain active chemical groups of the enzyme. Cases of moderate poisoning with

organophosphorus insecticides, commonest in workers in insecticide manufacturing plants, are characterized by symptoms such as dyspnea, headache, prolonged miosis, and irritability. In acute poisonings parasympathetic hyperactivity (miosis, bronchial spasm, bronchial hypersecretion, hypersalivation, emesis, and diarrhea), nicotinic symptoms (headache, hypertension, muscular contraction, and fasciculation), areflexic coma, and convulsive crises are common. Therapy includes atropine, administered in large doses depending on tachycardia, and the cholinesterase reactivators pralidoxime chloride and pralidoxime methanesulfonate.

74-0827. Matthew, H. (Reg. Poisoning Treatment Cent., Royal Infirmary, Edinburgh, Scotland). **[Paraquat poisoning.]** *Clin. Toxicol. 5(4): 581-582; 1972.*

A Letter-to-the-Editor refutes evidence presented in a paper on Paraquat Poisoning—Prolonged Excretion (see abstract no. 72-0544) showing that paraquat was responsible for lung changes in the patient. The ingested amount of Weedol, a dilute preparation of paraquat which does not produce paraquat lung in man except in very large doses, was small. The fact that lung changes observed on the third day were not followed by rapid progression and death in 1-3 weeks and respiratory function improved with time suggests that the lung pathology had been present before ingestion of the herbicide. Pathologists from ICI's Industrial Hygiene Research Laboratories who had access to the biopsy specimens did not feel that fibrotic changes were unequivocally those of a paraquat lung lesion.

74-0828. Beevers, D. G.; Rogers, W. N. (Author address not given). **Paraquat poisoning.** *Clin. Toxicol. 6(3): 503-505; 1973.* (3 references)

In a reply to a letter, (see abstract no. 74-0827) evidence is presented defending the suggestion that paraquat, taken in the form of Weedol granules in water, was probably responsible for the pattern of events observed in a patient. Clinical, radiological, and histological features, together with continued elimination of paraquat in the urine for 26 days indicated paraquat poisoning. At least one fatality from Weedol has been recorded, and the dosage in this case could not be determined accurately. References have not been given to show that death has always followed the histological features observed in this lung biopsy on the third day.

74-0829. Coomes, T. J. (Min. Agr., Fish., Food, Great Westminster House, Horseferry Rd., London, S. W.1, England). **Agricultural chemicals and food risks.** *Community Health (Bristol) 2(1): 42-48; 1970.* (8 references)

In contrast to food additive control in Britain, pesticides and veterinary products are regulated by voluntary schemes agreed between Government departments and industrial associations concerned. Legislation for a licensing procedure for pesticides has been proposed, but not yet enacted. Under the voluntary scheme new products or new uses or formulations of old products, as well as information concerning precautionary measures necessary in the use of the product, are brought to the attention of the Ministry of Agriculture, Fisheries, and Food and, if recommended, products are removed from the market. Four different types of clearance may be given to a product: trial clearance, limited clearance, provisional commercial clearance, and full commercial clearance. Recommendation has been made for the withdrawal of certain uses of DDT, dieldrin, and aldrin for which adequate and less persistent alternatives are available.

74-0830. Barry, R. M.; Womack, H. (Univ. of Georgia, Tifton, GA). **Cholinesterase activity determinations for personnel engaged in a cotton-scouting program.** *Environ. Entomol. 2(5): 961-963; 1973.* (1 reference)

Thirty-four healthy males between the ages of 17-28 participated in a cotton-pest management program in which they made weekly surveys of various Georgia cotton fields to determine insect population levels and existing damage; the fields which they surveyed were heavily treated with insecticides (toxaphene-DDT-methyl parathion, monocrotophos, and methyl parathion alone). Blood samples were taken from each participant prior to entering the fields for the first time and at two subsequent times. Cholinesterase activity was determined in the plasma, whole blood, and packed red blood cells. Since no significant deviations in cholinesterase activity were detected by these tests, no measurable intoxication occurred as a result of frequently entering cotton fields soon after insecticide treatment.

74-0831. Walker, W. H. (Illinois State Water Survey, Urbana, IL). **Where have all the toxic chemicals gone?** *Ground Water 11(2): 11-20; 1973.* (6 references)

Experience has shown that ground-water contamination with pesticides, trace metals, polychlorinated biphenyls, and many other toxic chemicals is a serious problem generally arising from poor control of disposal. In many cases, unless noticeable contamination of well water is observed, contributing disposal sites remain undiscovered because underground water supplies are not routinely tested. Investigation of the hydrologic environment of a shallow burial site where a pesticide manufacturing company was disposing of toxic waste materials in Tennessee showed that the local water supply was dangerously contaminated throughout a 150 acre area and that the primary aquifer system would be seriously contaminated for years to come. In another instance, arsenic of lead left over from a pesticide application in 1934 and buried in a shallow trench excavation caused illness in 13 employees of a construction company which acquired land adjacent to the site in

1972 and installed a shallow well. Little mixing of native water and polluted water generally takes place as recharge water carrying contaminants moves downward and then through the aquifer. Studies show that a serious threat to public health may be imminent unless all surface and underground sites of disposal of toxic materials are located, evulated, and corrected where necessary.

74-0832. Davay, G. G. (Govt. of Maharashtra, Factory Inspection Off., Bombay 34, India). **Methyl bromide poisoning.** *Indian J. Ind. Med. 18(2): 78-85; 1972.* (8 references)

Two cases of methyl bromide poisoning occurred during the manufacturing process, probably as a result of an employee's failure to close the sampling valve. The worker exposed to higher concentrations developed nausea and vomiting after three hours and then convulsions, unconsciousness, and anuria. Despite supportive therapy and hemo- and peritoneal dialysis, he died after 18 days. The second worker, exposed to lower concentrations, experienced only nausea and vomiting and recovered without ill effects. In India poisoning from methyl bromide has only previously been reported during fumigation operations or fire extinguishing. Sound engineering practices, preventive maintenance, air sampling, analysis of urine of workers for bromine levels above 5 mg%, and proper selection, instruction, and equipping of workers are essential to prvent further episodes of poisoning during manufacture.

74-0833. Chhabra, M. L.; Sepaha, G. C.; Jain, S. R.; Bhagwat, R. R.; Khandekar, J. D. (M.G.M. Med. College, Indore, India). **E.C.G. and necropsy changes in organophosphorus compound (malathion) poisoning.** *Indian J. Med. Sci. 24: 424-429; 1970.* (17 references)

A study of 35 cases of malathion poisoning has shown that ECG monitoring is warranted in detecting and consequently managing dysrhythmias resulting from severe intoxication. ECG changes were observed in all five of the cases with fatal outcome and in 37% of the total cases studied. In nine cases there was right axis deviation. This reverted to normal in five cases, indicating pulmonary edema as its genesis. ST segment and T wave changes were observed in 13 patients, within one week they had returned to normal except in the five fatal cases. All fatal cases had damage to the myocardium indicated by dilation of pericardial blood vessels with marked hemorrhages in surrounding tissues, interstitial edema, inflammatory cells, hemosiderin laden macrophages, and fatty infiltration of the myocardium.

74-0834. Kips, R. H. (Lab. Fytofarm., Rijksuniv., Ghent, Belgium). **Residu's van pesticiden. [Pesticide residues.]** *Ingenieursblad 41(20): 577-580; 1972.* (5 references) (Dutch)

Pesticide residue problems must be viewed scientifically in order to achieve practical solutions. Contact with pesticide residues is inevitable today; dietary ingestion occurs through intentional use of pesticides on crops or through accidental or careless contamination of food products. The amounts of residues resulting from use of pesticides in accordance with good agricultural practice and the toxicologic properties of the pesticides are the principal criteria used in establishing residue tolerances. Assessment of the toxicologic properties of pesticides requires consideration of terminal residues in plants, animals, and the environment; variability and composition of the technical product; and difficulties in extrapolation of toxicologic findings from animals to man. Residue tolerances are generally established by calculating the permissible intake level, based on long-term toxicity tests, and include a safety factor. The waiting period between treatment and harvest is also established by law for many crops and pesticides.

74-0835. Edwards, C. A. (Rothamsted Exp. Station, Harpenden, Herts., England). **Some influences of pesticides on the soil fauna.** *IIRB (Inst. Int. Rech. Betteravieres) 6(2): 87-93; 1973.* (12 references)

Non-persistent pesticides, other than fumigants, generally do not even halve the number of individuals or species of invertebrates in soil; most populations are restored within 1 or 2 years. The total effect of a chemical on invertebrate populations depends both on persistence and toxicity. A very toxic, non-persistent chemical could eliminate almost all animals from the soil for up to two years while a persistent chemical that is only slightly toxic might have few effects, and these would disappear with the pesticide. Since dose response is sometimes logarithmic, a large single dose may have less effect than the same quantity applied in several batches. Populations of invertebrates can be influenced indirectly by pesticide application since food supplies, generally plants, or predators might be reduced. Accumulation of persistent pesticides in the tissues of invertebrates, particularly molluscs, may lead to accumulation in those vertebrates that feed on them.

74-0836. Schall, E. D.; Rund, R. C. (Dept. Biochem., Purdue Univ., W. Lafeyette, IN 47907). **Inspection of herbicides, 1971.** *IN: Indiana Agricultural Experiment Station Report No. 95, 1971, 12 pp.*

Under the Indiana Herbicide Law of 1961 the State Chemist was responsible for the registration of herbicidal products. In 1971, 114 registered products were examined to verify label information, and 11 were found to be deficient in at least one constituent. A new law enacted in 1971 extends the former law to pesticides in general. The law requires product registration label examination prior to sale and distribution and provides for inspection of marketed products for verification of label guarantees. A provision has been made for the

appointment of a Pesticide Review Board to determine use restrictions on selected pesticides.

74-0837. Nishimura, H. (Dept. Anat., School Med., Kyoto Univ., Kyoto, Japan). **Teratogenic substances.** *Int. Chem. Eng. 13(4): 774-780; 1973.*

Human experience has indicated that mercury, lead, and polychlorinated biphenyls, and possibly organophosphates and other agricultural chemicals, induce fetal abnormalities when present in the human body in large amounts. Pathological changes in the nervous system characterized cases of mercury poisoning resulting from ingestion of fish containing alkyl mercury and meat from a pig poisoned with a mercury fungicide. Sterility, abortion, stillbirth, neonatal mortality, and abnormalities have long been associated with occupational exposure to lead. Yusho disease in Japan, associated with accidental ingestion of polychlorinated biphenyls, had such symptoms as stillbirth or substandard body weight, abnormal pigment and desquamation of skin and mucous membranes, early appearance of teeth, calcification of the skull, exophthalmos, and gingival hypertrophy. Studies of pregnant women occupationally exposed to agricultural chemicals indicated a high frequency of deformed infants, but specific chemicals were not studied. In animals DDT, dieldrin, endrin, chlordane, kepone, DFP, 2,4,5-T, and milex (mirex) were lethal to fetuses in large amounts. DDT, kelthane (dicofol), parathion, diazinon, TEPA, metepa, carbaryl, thiram, dioxin, 2,4-D, malathion, and apholate were teratogenic.

74-0838. Grimaas, U.; Nilsson, N. A.; Toivonen, J.; Wendt, C. (Environ. Protect. Bd., Res. Lab., Drottningholm, Sweden). **The future of salmonid communities in Fennoscandian lakes.** *J. Fish. Res. Bd. Can. 29(6): 937-940; 1972.* (1 reference)

In trying to make predictions for the future of the Fennoscandian lakes it is difficult to disregard the obvious threat of a common protein deficiency in the world population. At the moment, however, there is a trend in the fishery away from a commercial and subsistence gillnet fishery towards a use of the lakes for recreational purposes. Eutrophication induced by man is proceeding everywhere, although governmental authorities are aware of this threat. In some large lakes the process may have reached an optimum where it is still favoring production of relatively large yields of some important species of fish. Exploitation of some species, for example salmonids and sander, is in some cases overly intensive, but is not yet regarded as a serious problem. Introductions of "exotic" species have had little influence on native stocks. The release of hatchery-reared landlocked salmon, rainbow trout, and lake trout will hopefully raise the value of the fishery in some lakes in the future. Pollution by toxic substances such as mercury, DDT, and PCB, and the fall-out of SO_2 from the atmosphere, are at present the most serious threats to the fishery. (Author abstract by permission)

74-0839. Enderson, J. H.; Wrege, P. H. (Dept. Biol., Colorado Coll., Colorado Springs, CO 80903). **DDE residues and eggshell thickness in prairie falcons.** *J. Wildl. Manage. 37(4): 476-478; 1973.* (12 references)

The eggshell thickness of prairie falcon (*Falco mexicanus*) eggs collected in Colorado in 1967-68 and 1972, is related linearly and inversely to the logarithms of the DDE content of the eggs. This relationship is not statistically different from that found in peregrine falcons (*F. peregrinus*) and brown pelicans (*Pelecanus occidentalis*). DDE levels in prairie falcon eggs are about one-fifth and one-sixteenth those shown in Alaskan peregrine eggs and California brown pelican eggs, respectively, and despite some shell thinning, prairie falcons in Colorado are reproducing well. Shell thickness averaged higher, egg DDE residue lower, and hatch rate was greater in 1972 than in 1967-68 in the prairie falcons, but the differences are not significant. (Author abstract by permission)

74-0840. Shurpach, L. S.; Salimova, V. M. (Uzbek Sci. Res. Inst. Sanit., Hyg., Occup. Dis., USSR). **Funktsional'noye sostoyaniye serdechno-sosudistoy i dykhatel'noy sistem pri ostroy i khronicheskoy intoksikatsiyakh fosfororganicheskimi i khlororganicheskimi pestitsidami. [Functional state of the cardiovascular and respiratory system during acute and chronic poisoning by organophosphorus and organochlorine pesticides.]** *Med. Zh. Uzb. 6: 54-56; 1973.* (Russian)

Changes in the functional characteristics of the cardiovascular and respiratory systems during acute and chronic poisonings by organophosphorus and organochlorine pesticides were analyzed on the basis of 24 cases of acute and 118 cases of chronic poisoning by such pesticides. Both acute and chronic poisonings with organophosphorus and organochlorine pesticides were characterized by sinus bradycardia, arrhythmia, prolongation of the Q-T intervals (electric systole), and by an alteration of the end section of the ventricular complex. Capillary spasm and bronchial spasm were also observed. The changes in the cardiovascular and respiratory parameters should be taken into account in the therapy of acute and chronic poisonings with organophosphorus and organochlorine pesticides.

74-0841. Bauer, E.; Reisner, G. (Kaiser-Franz-Joseph-Spital der Stadt Wien, Hals-Nasen-Ohren-Abteilung, A-1100 Vienna, Austria). **Ein Fall von Panmyelophthise nach Verspruehung eines Hexachlorcyclohexan-Spritzmittels in Oesterreich. [Panmyelophthisis after splashing with BHC in Austria.]** *Monatsschr. Ohrenheilk. Laryngo-Rhinol. 104: 492-495; 1970.* (14 references) (German)

A case of panmyelophthisis in a 58-year-old farmer is reported following application of a lindane-dieldrin spray on potato fields. On the third and last day of spraying, the patient noted peeling of his facial skin with severe burning. Nausea, photophobia, and a painful abscess in the region of the right submandibular gland developed subsequently. Later on, an erythrocyte count of 2,180,000/mm^3, a leukocyte count of 3,650/mm^3, and a thrombocyte count of 67,040 were measured. The leukocyte count further fell to 550/mm^3, and the ratio of segmented cells to lymphocytes was 23:69. The patient died about 1.5 months after poisoning. No other causative factor for the panmyelophthisis than lindane was recognized in the patient's history. The patient had been allergically predisposed for years. The findings indicate a myelotoxic effect of BHC.

74-0842. Greenblatt, D. J.; Shader, R. I. (Clin. Pharmacol. Unit, Massachusetts General Hosp., Boston, MA 02114). **Drug therapy. Anticholinergics.** *N. Engl. J. Med. 288(23): 1215-1219; 1973.* (23 references)

One of the few therapeutic uses of atropine which has been demonstrated to be effective is the treatment of poisoning by ChE inhibitors, like soman or parathion, and by muscarinic agents in mushrooms. Nerve gases or organophosphorus insecticides cause cholinergic hyperactivity, including bradycardia, sialorrhea, bronchospasm, and depolarizing neuromuscular paralysis. Atropine, sometimes administered with pralidoxime, is most effective in these cases if given soon after exposure. Fatality from an overdosage of atropine is rare, and intoxication is usually of short duration and relatively benign. Physostigmine, a nonquaternary ChE inhibitor, can reverse delirium and hyperpyrexia, if they occur.

74-0843. Burnet, A. M. R. (Fisheries Res. Div., Min. of Agr. and Fisheries, Wellington, New Zealand). **Effects of paraquat on invertebrates in a Canterbury stream, New Zealand.** *N. Z. J. Mar. Freshwater Res. 6(4): 448-455; 1972.* (6 references)

In 1966 and 1967, paraquat (2 ppm) was applied on three separate occasions to control aquatic weeds in the South Branch experimental stream, a tributary of the lower Waimakariri River, in Canterbury, New Zealand. Surber and drift-net samples were collected to study the effects of applications on the invertebrate fauna of the stream. The paraquat applications had a pronounced effect on the amphipod fauna, which were found dead in increasing numbers throughout the experimental period; a direct and prolonged toxic effect was indicated. The numbers of molluscs and hemipterans found dead after paraquat treatment also increased with time. Over the whole observation period, there was an increase in the total numbers of invertebrates in the Surber samples, mainly due to increases in the numbers of trichopterans. It is concluded that the use of paraquat for aquatic weed control will severely reduce the amphipod fauna.

74-0844. Glazko, I. V. (Central Hospital, Novoazov Region, Donetsk, USSR). **Dinamicheskiye nablyudeniya za sostoyaniyem organa zreniya u lits s khronicheskoy intoksikatsiyey yadokhimikatami, rabotayuschikh v sel'skom khozyaystve. [Dynamic observations of the status of the eye in agricultural workers with chronic pesticide poisoning.]** *Oftal'mol. Zh. 25: 283-287; 1970.* (35 references) (Russian)

The status of the eyes was studied prospectively in 260 agricultural workers with a 2-15 year history of direct contact with pesticides such as granosan, parathion, aldrin, DNOC, arsenic, dinitrophenol derivatives, and organophosphorus preparations. Pronounced functional impairment and anatomic changes in the eye were observed along with somatic manifestations of chronic poisoning (fatigue, irritability, sleeplessness, headache, and gastrointestinal disturbances) in 48% of the cases. Chronic blepharoconjunctivitis, ptergyium, dilatation of the perilimbal vessels, dystrophy of the iris with atrophy of the stroma, impairment of color perception, reduction of the sensitivity of the retina, narrowing of the peripheral achromatic field, enlargement of the physiologic scotoma, and reduced dark adaptation were the principal eye findings. One group, showing the most serious symptoms, was treated with biogenic stimulation and vitamins; another group was assigned to jobs excluding close contact with pesticides; and a third group continuted to work with pesticides. After 1.5 years of observation, the treatment was judged highly effective, with restoration of normal or nearly normal visual and somatic function. The suppression of all contact with pesticides did not always improve the visual status. Continued contact with pesticides by workers with initially insignificant disorders of the eye resulted in deterioration of the visual functions.

74-0845. Masoud, A. N.; Elder, J. T.; Czerwinski, A. L. (School of Pharm., Creighton Univ., Omaha, NB). **Chemistry and pharmacology of common acute poisoning in children.** *Paediatrician 2(1-2): 2-37; 1973.* (49 references)

Agents commonly causing acute poisoning in children, including lead, thallium, mercury, arsenic, and pesticides, have been reviewed with respect to structure, toxic dosages, identification tests, pharmacologic properties, and therapy. Organophosphates and carbamates or their metabolites inhibit ChE; some organophosphates cause demyelination of peripheral nerves and spinal cord. Atropine is used for both types of poisoning and 2-PAM, given early, is effective with some organophosphates. Central nervous system effects are characteristic of organochlorine poisoning, and the extent of poisoning is governed not only by dose, but by formulation.

74-0846. Papaevangelou, G.; Adam, G.; Karampoula, K.; Matsaniotis, N. (Dept. Hyg., Athens Univ., Athens 609, Greece). **Childhood poisoning—a universal problem.** *Paediatrician 2(1-2): 38-46; 1973.* (9 references)

Mortality resulting from accidental poisonings in children seems to be decreasing, probably because of a greater awareness of the problem and sophistication in treatment, but more effort is needed in the area of prevention of morbidity. Pesticide poisonings occur more frequently in the hot months when use of the chemicals is greatest. Over a 4-yr period, pesticides accounted for 10.2% of poisoning admissions in the Department of Pediatrics at Athens University. During the same period, 33% of the pesticide poisonings occurred in the 2-year age group.

74-0847. Mofenson, H. C.; Greensher, J.; Horowitz, R. (Poison Contr. Cent., Nassau County Med. Cent., East Meadow, NY 11554). **Current treatment of acute childhood poisoning.** *Paediatrician 2(1-2): 60-69; 1973.* (14 references)

Treatment of acute childhood poisoning by pesticides and household products is constantly being revised as more information is obtained on effectiveness. Emesis induced with syrup of ipecac has been found more effective than gastric lavage in removing poisons. However, it should not be used when the patient has ingested a corrosive or petroleum distillate product or is in coma or convulsions. Activated charcoal, given in a dose 10 times greater than the amount of poison ingested, is useful in absorbing phenol, but not DDT or malathion. Organophosphates other than diazinon may be counteracted with atropine and pralidoxime. Atropine is used alone in the treatment of other ChE inhibitors. Forced and osmotic diuresis and diuretics can be dangerous in small children, but peritoneal and hemodialysis are used to remove some poisons. Supportive therapy is still of primary importance in acute poisonings. Epinephrine, used as supportive therapy in some situations, is contraindicated in chlorinated hydrocarbon, organophosphate, and carbon tetrachloride intoxications.

74-0848. Sesso, A. M.; Silverio, J. (Dept. Pediatrics, Misericordia Hosp., Philadelphia, PA 19143). **The epidemiology of childhood poisoning in the United States of America.** *Paediatrician 2(1-2): 90-94; 1973.* (17 references)

A review of childhood poisonings indicates that pesticides, mainly rodenticides and petroleum distillates, are far more dangerous than drugs. They are responsible for about 3% of fatal and 10% of nonfatal poisonings in children from 1-2 years of age. Although ingestion of mothballs is decreasing because of the availability of sprays and flakes, an increase in the use of chemicals to eradicate crop pests has introduced a new hazard, particularly in the South and West Central Plains states. With higher temperatures and the consequent appearance of more pests, exposure to pesticides is greater. Organophosphates may be dermally absorbed as well as ingested.

74-0849. Dezoteux, H.; Vinceneux, P. (Hopital Averroes, Service de Reanimation et Centre Antipoison, Casablanca, Morocco). **Le poumon et les intoxications volontaires massives par organo-phosphores. [The lung in massive intentional poisoning with organophosphorus substances.]** *Poumon Coeur 26(8): 937-940; 1970.* (1 reference) (French)

General and pulmonary affections in acute poisonings with organophosphorus substances in general and with parathion in particular are surveyed on the basis of 195 acute poisonings occurring in the last seven years in Casablanca. Most of the cases were intentional poisonings, and 24 of the 195 cases were lethal. Coma, respiratory distress, cyanosis of the face and limbs, dyspnea, mucous hypersecretion, diarrhea, miosis, muscular fasciculation, reduced cholinesterase activity, hyperglycemia, and glycosuria were found in a 20-year-old female who was hospitalized for acute poisoning with an organophosphorus insecticide. Anoxia, hypercapnia, dilatation of the parietal capillaries with erythrodiapedesis, and seroalbuminous exudate in the alveoli were also observed. Atropine, resuscitative measures, and pralidoxime for cholinesterase reactivation are necessary in the treatment of acute poisonings with organophosphorus pesticides.

74-0850. Brown, E. R.; Keith, L.; Kwapinski, J. B. G.; Hazdra, J.; Beamer, P. (Univ. Health Sci., Chicago Med. School, Chicago, IL 60612). **Frequency of tumors in fish populating a polluted water system.** *Proc. Amer. Ass. Cancer Res. 14: 1; 1973.*

A comparison of neoplasms in fish was made between a control watershed and a watershed containing chlorinated hydrocarbons, insecticides, triazines, sulfates, phosphates, lead, mercury, zinc, magnesium, crude oil, gasoline, benzene, benzanthracene, and other chemicals in excess of state standards. The abstract indicates that a tumor frequency of 4.38% was observed in the polluted Fox River watershed, while the relatively uncontaminated stream produced a frequency of 1.03%. In the fish from the Fox River area 13% of the tumors were in the stomach, 18% in the skin, and 14% in the rectum. Respective values in Canadian fish were 9%, 9%, and 7%. (Material from this article presented at the Sixty-Fourth Annual Meeting of the American Association for Cancer Research, held April 11-13, 1973).

74-0851. Mazzei, E. S.; Mazzei, C. M. (Univ. Nat. de Buenos Aires, Hospital de Clinicas Jose de San Martin, 1ra Catedra de Medicina, Buenos Aires, Argentina). **Une intoxication par un fongicide, l'hexachlorobenzene, souillant les grains de ble. [Poisoning by a fungicide, hexachlorobenzene, contaminating wheat grains.]** *Sem. Hop. 49(4): 63-67; 1973.* (34 references) (French)

Symptoms of chronic poisoning due to occupational contact with hexachlorobenzene (HCB) in a 24-year-old male agricultural worker and the symptoms

of epidemic porphyria caused by the ingestion of hexachlorobenzene-contaminated bread in Turkey were similar. Erosive lesions and blisters on the hands and face, hypertrichosis of the malar region, and hyperpigmentation of the exposed parts of the skin were among the first symptoms of the poisoning. Asthenia, hepatomegaly, increased blood glutamate-oxalacetate transaminase, glutamate-pyruvate transaminase, glutamate dehydrogenase, sorbitol dehydrogenase, and leucine aminopeptidase levels, normal delta-aminolevulinic acid level, and elevated uroporphyrin and coproporphryin levels were determined. The blood hexachlorobenzene level fell from an initial value of 0.383 to 0.268 in a year. Recovery from the porphyria took about a year.

74-0852. Conder, P. (Royal Soc. for Protection of Birds, The Lodge, Sandy, Bedfordshire, England). **Illegal use of alphachlorolose.** *Vet. Rec. 92(12): 325; 1973.*

There have been many recorded instances in Great Britain where bait treated with alpha-chloralose was placed in the open to illegally poison vermin such as crows, gulls, and foxes. However, numerous protected birds of prey such as the golden eagle, buzzard, and hen harrier have also succumbed to these baits. Analyses of baits and the resulting dead birds have also revealed the illegal use of poisons such as strychnine, cyanide, and phosdrin. Although alpha-chloralose is an effective means of controlling undesirable species when handled responsibly, this readily available poison is often abused. Citizens are urged to combat its illegal and indiscriminate use.

74-0853. Gunn, S. D. (Penmellyn, St. Columb, Cornwall, England). **Illegal use of alphachlorolose.** *Vet. Rec. 92(14): 382; 1973.*

Alpha-chloralose is being used illegally and indiscriminately to kill birds of prey. However, it has also been used against jays, magpies, herring, and black-backed gulls. Harm has also been extended to pets. In one instance, a farm collie was poisoned by eggs treated with this chemical and left in a tree. There have undoubtedly been other cases of poisoning, and more cases will occur unless stricter controls over the availability of this substance are brought into operation.

74-0854. Orton, R. G. (The Surgery, 7 Park Rd., Fordingbridge, Hampshire, England). **Methiocarb poisoning in the dog.** *Vet. Rec. 93(17): 478; 1973.*

A case of methiocarb poisoning in the dog is reported in a Letter-to-the-Editor. The letter indicates the need for including the name of an antidote for a particular pesticide on the label. The dog was received in a state of collapse, with profuse salivation, Cheyne-Stokes respiration, pin-point pupils, opisthotonus, acute muscular rigors, very irregular pulse and heart rate, cyanotic mucous membranes, and passage of a sticky material from the rectum. Oxygen was given by mask and Nembutal was administered to facilitate passing an endotracheal tube and a stomach tube. Lungs were artificially ventilated for two hours. No information could be obtained from the poison center, but by chance the manufacturer was able to contact the proper personnel (Sat. afternoon), and instructions were received to withhold anaesthesia and to give atropine until pupils began to dilate. The dog recovered in 24 hours.

74-0855. Turner, T. (15 Mandeville Rd., Northolt, Middlesex, England). **Toxicity of metaldehyde to dogs.** *Vet. Rec. 93(19): 524; 1973.* (6 references)

A survey of the incidence of small animal toxicoses in Great Britain would be of interest although the results would be open to some doubt. Clinical assessment is particularly difficult. A fairly high proportion of toxicological problems remains undiagnosed since the animals recover with general supportive therapy. The most common toxic agents affecting dogs appear to include warfarin, ethylene glycol, metaldehyde, organophosphates, and chlorinated hydrocarbons. Recovery from metaldehyde poisoning appears to be directly related to the speed with which convulsions are controlled. Therapy may include light diazepam anesthesia followed by gastric lavage and, if necessary, fluid and multivitamin treatment.

74-0856. Khan, M. A. (Res. Station, Canada Dept. Agr., Lethbridge, Alberta, Canada). **Toxicity of systemic insecticides: efficacy of dermal and parenteral applications of crufomate for systemic control of *Hypoderma* spp. in cattle.** *Vet. Rec. 93(19): 528-532; 1973.* (17 references)

At doses of crufomate effective in controlling cattle grubs, i.e., 0.5% spray, 8.3% pour-on, 12% spot-on, or 10 mg/kg intramuscular or intraperitoneal injection, signs of organophosphate poisoning were observed only in the group of calves weighing less than 136 kg. The heavier calves had apparently overcome the stress of weaning and change of diet and were less susceptible to the toxicity of crufomate. Weight gain and final body weights did not differ between untreated and treated (spot-on) animals. Signs of poisoning ranged from dullness, depression, rapid breathing, profuse salivation, and lachrymation to ataxia, staggering gait, and posterior paresis. Sprayed calves were affected more than those treated by other methods, required atropine treatment, and still showed signs of poisoning after one week. Two weeks after treatment all calves appeared normal. Hair collected from the back after 30 days contained 2,400 ppm in the group treated with spray at 145 mg/kg and 16,500 in the group treated with 50 mg/kg poured on.

74-0857. Golosnitskiy, A. K.; Shcherban', N. F.; Skargin, V. I.; Filipovich, N. P. (North-Caucasian Zonal

Sci. Res. Inst. Vet., USSR). **K toksikologii khlorofosa. [Contribution to the toxicology of trichlorfon.]** *Veterinariya (Moscow) 4: 102; 1973.* (Russian)

Acute poisoning of breeder bulls which were confined after disinfection with 3%-solution of trichlorfon is reported. Anorexia, depression, salivation, tremor of skeletal as well as head and neck muscles, deep atony of the rumen, hypothermia, bradycardia, motor coordination disorders, and diarrhea were the first symptoms of poisoning. Some cases of death from pulmonary edema occurred. Cyanosis of the mucosa, hyperemia of liver, spleen, kidney, and especially of the lungs, subepicardial and endocardial hemorrhages, and enlargement of the gallbladder were determined on autopsy. The poisonings were due to the prolonged inhalation of high concentrations of trichlorfon in an enclosed space.

74-0858. Doenhardt, A. (Allgemeines Krankenhaus Barmbek, D-2 Hamburg 33, Germany). **Sofortmassnahmen bei Vergiftungen. [First aid in poisoning.]** *Wien. Med. Wochenschr. 120(36): 585-591; 1970.* (German)

The therapy of poisonings with various poisons, drugs, and pesticides is described. Gastric lavage is indicated in cases of poisonings with pesticides with the exception of alkylphosphates and herbicides. Oral administration of paraffin oils and possibly sedation with i.v. administered Valium are necessary in poisonings with cyclic halogenated hydrocarbons of the DDT type. Administration of atropine up to 200 mg/day depending on the dryness of the buccal mucosa, and cholinesterase reactivation with 1 to 2 doses of 250 mg toxogonin (obidoxime) only during the first 24 hr are applied in poisonings by alkylphosphates. Atropine, but not toxogonin, should be used in cases of carbamate poisoning. Paraffin and early dialysis are necessary in the treatment of paraquat poisonings.

See also 74-0761 74-0772 74-0819 74-0876 74-0889 74-0905 74-0918

74-0859. Devillers, C.; Chanconie, M. (Lab. d'Anatomie Comparee, Universite de Paris VII, France). **Action du 2,4-dinitrophenol sur la segmentation de l'oeuf de truite (*Salmo irideus* Gib.). [Effect of 2,4-dinitrophenol on the segmentation of the trout (*Salmo irideus* Gib.) eggs.]** *Acta Embryol Exp. 3: 279-298; 1972.* (31 references) (French)

Eggs of rainbow trout (*Salmo irideus* Gib.) were subjected to the the action of 0.0001 *M* 2,4-dinitrophenol in water from the 8-blastomere stage to the blastula stage. Below a certain limiting contact time eggs were able to continue developing at least partially after transfer to fresh water. This limiting contact time with dinitrophenol increased with increasing age of the egg, from 8.5 hr for the 8-blastomere stage to 72 hr for the blastula. The eggs were classified as sensitive or resistant. If resistant, the eggs resumed development up to hatching when transferred to fresh water. If they were sensitive, abnormal development that stopped before the gastrula stage resulted. A study of the mitoses revealed strong reduction of the achromatic spindle, but not of the asters. The chromosomes were sticky and aggregated into an irregular mass. In eggs treated during interphase the corresponding division failed to occur, whereas treatment did not interrupt divisions already taking place.

74-0860. Svendsen, O. (Inst. Pharmacol. Toxicol., Royal Vet. Agr. Univ., 13 Buelowsvej, DK-1870 Copenhagen V, Denmark). **The ultrastructure of livers from chickens embryogenically injected with DDT.** *Acta Pharmacol. Toxicol. 33(2): 113-122; 1973.* (30 references)

Fertile chicken eggs injected embryogenically on the 5th day of incubation with 200 or 400 ppm DDT in peanut oil had 71 and 93% hatchability as compared with 93% and 86% in controls and eggs injected with peanut oil. Chickens from treated eggs showed characteristic DDT-induced tremors on the second and third day after hatching. Liver DDT levels increased from 403 to 521 ppm with the low dose and from 496 to 1330 ppm with the high dose during the three days after hatching. At the same time there was a marked increase in agranular endoplasmic reticulum and prolongation and accentuation of the presence of mitochondrial myeloid bodies. The hepatic fine structural changes support the assumption that DDT increases the activity of drug metabolizing enzymes in hepatocytes and suggest that DDT can prolong or reinduce cellular immaturity.

74-0861. Faff, J. (Dept. Exp. Pharmacol., Med. Acad., Warsaw, Poland) **Studies on acetylcholinesterase regeneration in animals intoxicated with pinacolyl-methylphosphonofluoridate.** *Acta Physiol. Pol. 23(4): 747-755; 1972.* (25 references)

AChE regeneration was studied in rats experiencing slight convulsions along with other symptoms of organophosphate poisoning following administration of soman at 80μg/kg together with atropine. Plasma AChE was inhibited at first but regenerated in a period of about 9 days, exhibiting a rebound effect. Initial inhibition of the enzyme was about 4% in plasma and erythrocytes, 15% in diaphragm, 19% in diaphragm homogenate, 27% in skeletal muscle, 10% in brain, and 7% in brain homogenate. Approximately 3, 54, 192, and 158 days were required for regeneration of enzyme of diaphragm, erythrocytes, brain homogenate, and brain tissue, respectively. The results suggest that extracellular AChE regenerates more rapidly than intracellular enzyme.

74-0862. Rusiecki, W.; Osicka, A. (Dept. Toxicol. Chem., Med. Acad., Warsaw, Poland). **Distribution and excretion of mercury in rats intoxicated with methylmercury dicyandiamide.** *Acta Pol. Pharm. 29(6): 623-628; 1972.* (14 references)

Methylmercury dicyandiamide administered orally at a dose of 34 mg/kg was rapidly absorbed into the blood and tissues of male rats, with levels in blood exceeding those in tissues for 6 days after intoxication. In kidneys a peak average level of 74.2μg/kg mercury was observed after three days, and constant levels were noted between the 14th and 28th days. The ratio of free to organic mercury gradually increased in this organ as well as in the liver. Brain accumulated mercury more slowly than liver and kidney, and the average peak level was 16.0 μg/kg. Only 1.2% and 3.5% of the dose were excreted in the urine and feces, respectively, within seven days after administration. Benzene extractable metabolites were not found in urine or feces.

74-0863. Mehani, S. (Medico-Legal Dept., Fac. of Med., Ain Shams Univ., Cairo, Egypt). **The toxic effect of paraquat in rabbits and rats.** *Ain Shams Med. J. 23(6): 599-601; 1972.* (7 references)

Pure paraquat dichloride powder dissolved in normal saline was administered i.p. or orally to female rats and male white rabbits. Paraffin sections of their lungs were then stained and examined microscopically. Among the rats, five out of six injected i.p. died within 2 to 7 days; four out of seven to which the chemical was administered orally died within 10 to 19 days. Similar results were obtained with the rabbits. The lethal dose for rats was higher than that for rabbits when the compound was administered orally; no correlation was found with i.p. administration. Signs of toxicity included loss of appetite and weight, irritability, hyperexcitability, and lack of coordination. Rats which died shortly after administration of the poison showed congestion, exudative fluid, many phagocytes in the alveoli, and perivascular and peribronchial edema. Rats which lived longer showed numerous fibroblasts, leucocytes, and eosinophils interstitially and around the blood vessels and bronchi. The rabbits showed evidence of a mild pulmonary infiltration of lymphocytes and plasma cells, with no hemorrhage, tissue destruction, or fibrosis.

74-0864. Brownson, R. H.; McDougal, H. D.; Suter, D. B. (Dept. Human Anat., Univ. of California, Sch. of Med., Davis, CA). **Parathion-induced changes in acetylcholinesterase of the olfactory bulb in the immature rat.** *Anat. Rec. 172(2): 278; 1972.*

A single daily LD50 (1.25 mg/kg) dose of parathion in carbowax was administered i.p. to 30-day-old female albino rats. Within 7 days, the brains were processed by perfusion with 4% paraformaldehyde and/or decapitation and immersion fixation. The acetylcholinesterase (AChE) reaction product was generally distributed throughout the cortical area of the olfactory bulb and was membrane bound in the cytoplasm, processes, and synaptic regions of the neurons. All of these reaction areas were negative when inhibited by eserine. The reaction product was markedly diminished in these areas in the parathion treated animals. A positive reaction was noted over nuclei; this was not affected by parathion, iso-OMPA (Schradan), or eserine inhibitors in the incubation medium.

74-0865. Clark, G.; Pearson, D. W. (Dept. Anat., Med. Univ. of South Carolina, Charleston, SC). **Visual discrimination in chronic disulfoton poisoning.** *Anat. Rec. 172(2): 291; 1972.*

Long-Evans rats were fed ground laboratory chow or the same chow with 50 ppm disulfoton over two months. At this time, the acetylcholinesterase levels in the brains of the disulfoton treated animals were reduced to about one fourth the control levels. All animals were trained using a Lashley Jumping Stand apparatus; the task required a complex motor response, depth perception, and discrimination. Relative to the untreated controls, the disulfoton treated rats showed no performance deficits. The results are discussed in terms of the critical level theory of Aprison and Russell.

74-0866. Billard, R.; Kinkelin, P. de (Cent. Nat. de Recherches Zootech., Station Centrale de Physiol. Animale, Jouy-en-Josas, France). **Sterilisation des testicules de guppies par des doses non lethales de parathion. [Sterilization of the testicles of guppies by means of non-lethal doses of parathion.]** *Ann. Hydrobiol. 1(1): 91-99; 1970.* (34 references) (French)

Sexually immature males and mature male and female guppies were kept in water containing 0.01 to 10 ppm of parathion to study the effect of parathion on the testicles and sexual maturation of guppies. At the 10 ppm dose the fish died within a few hours while the lower concentrations caused no considerable mortality. Concentrations of 0.01-1 ppm did not interfere with spermatogenesis either, provided the exposure time was short enough (six days). Parathion markedly inhibited the spermatogenesis, expressed by a decrease in the number of germ cells as a direct function of the parathion concentration when the fish were kept in water with 0.01-1 ppm of parathion for over 40 days. A certain number of spermatogonia subsisted, however, in the apex of the tubules. Spermatogenesis was restored two months after the end of the poisoning test. The results were similar to those obtained after hypophysectomy, which suggests that parathion may play the role of the gonadotropic factor. Exposure to 0.01-1 ppm concentrations of parathion for six days did not provoke alterations in the spermatogenesis of adult guppies and did not interfere with the development of spermatogenesis in immature guppies.

74-0867. Sharma, L. N.; Saxena, S. N. (Govt. Agr. Res. Station, Durgapura, Jaipur (Rajasthan), India). **Influence of dalapon (2,2-dichloropropionic acid) on biotic potential of soil.** *Andhra Agr. J. 18(2): 74-78; 1971.* (5 references)

Soil microorganisms were counted at intervals from 2-32 days after application of various amounts of dalapon to potted soil which had been inoculated with *Azotobacter chroococcum* to give special stress on this microbe. Dalapon significantly decreased *Azotobacter* and the bacterial population at concentrations above 3.0 ppm and increased actinomycetes at 1.5 ppm or greater. No significant effect on soil fungi was noted. Maximum activity was observed between days 8 and 14, and it was assumed that most of the dalapon was decomposed during this period.

74-0868. Engelhardt, G.; Wallnoefer, P. R.; Plapp, R. (Bayerische Landesanstalt fuer Bodenkultur und Pflanzenbau, Munich, Germany). **Purification and properties of an aryl acylamidase of *Bacillus sphaericus*, catalyzing the hydrolysis of various phenylamide herbicides and fungicides.** *Appl. Microbiol. 26(5): 709-718; 1973.* (33 references)

From *Bacillus sphaericus* ATCC 12123 an aryl acylamidase (EC 3.5.1.13) was purified to homogeneity by ion exchange chromatography, gel filtration, and polyacrylamide gel electrophoresis. The enzyme is inducible by various phenylamides of the acylamide, phenylcarbamate, and methoxysubstituted phenylurea type. It has a molecular weight of 75,000. Enzyme activity was inhibited by sulfhydryl reagents, several metal ions, and 3,4-dichloroaniline (a product of linuron degradation). A requirement for divalent metal ions in enzyme activity could not be demonstrated. In the presence of 6 *M* urea an irreversible inactivation of the enzyme occurred. The hydrolysis of L-alanine-4-nitroanilide was competitively inhibited by puromycin. (Author abstract by permission)

74-0869. Gibel, W.; Lohs, K.; Wildner, G. P.; Ziebarth, D. (Robert Roessle Klinik, Abteilung Praeventive Onkologie, 1115 Berlin-Buch, Lindenberger Weg 80, DDR). **Tierexperimentelle Untersuchungen ueber die hepatotoxische und kanzerogene Wirkung phosphor-**

organischer Verbindungen. I. Mitteilung: Trichlorfon. [Experimental studies on hepatotoxic and carcinogenic activity of organophosphorus compounds. Report I: trichlorfon.] *Arch. Geschwulstforsch. 37(4): 303-312; 1971.* (18 references) (German)

Male and female Wistar rats were administered 30 mg of trichlorfon per kg of body weight three times a week p.o. or s.c. Trichlorfon was applied cutaneously to mice. Slight steatosis of the liver and bronchopneumonia were the causes of death in animals dying within the first six months of the experiment. In animals surviving the first six months varying degrees of liver damage, associated with steatosis, liver cell necrosis, and cirrhosis were determined on autopsy. Pronounced cachexia, ascites, and hyperplasia of the spleen were also observed. Two liver cell carcinomas developed after cutaneous application of trichlorfon for 17 months and 14 months, respectively. Local, polymorphous-cell sarcomas developed following cutaneous application of trichlorfon with croton oil. Trichlorfon, when applied s.c., did not cause local tumors. Among a total of 148 animals surviving six months, 13 cases of papilloma in the forestomach were observed.

74-0870. Gibel, W.; Lohs, K.; Wildner, G. P.; Ziebarth, D.; Stieglitz, R. (Abt. Praeventive Onkologie, Zentralinst. fuer Krebsforschung, Berlin-Buch, DDR). **Ueber die kanzerogene, haematotoxische und hepatotoxische Wirkung pestizider organischer Phosphorverbindungen. [Experimental study on carcinogenic, hematotoxic, and hepatotoxic activity of phosphor-organic pesticides.]** *Arch. Geschwulstforsch. 41(4): 311-328; 1973.* (31 references) (German)

The carcinogenic, hematotoxic, and hepatotoxic effects of trichlorfon and dimethoate were studied by histological, cytological, and hematological investigations in Wistar rats and mice. Trichlorfon doses of 15 mg/kg of body weight were introduced into rats through gastric tube or i.m. twice a week; dimethoate was administered in doses of 5, 15, and 30 mg/kg. Trichlorfon and dimethoate were applied on the skin of mice twice a week for six weeks. Animals that survived more than six months showed, apart from the known hepatopathies, lesions such as steatosis, stasis, cell necrosis, fibrosis, cirrhosis, pronounced hyperplasia of the hemopoietic parenchyma of the bone marrow, extraosseal myeloid metaplasia especially in the liver and spleen, and leukocytosis in the peripheral blood in 33% and 22% of the animals treated with trichlorfon and dimethoate, respectively. The first animal died on the 353rd day of the experiment with malignant reticulosis. Among the benign tumors 23 papillomas and papillomatoses of the omasum, 5 lung adenomatoses, 7 fibroadenomas of the mammary gland, 5 cholangiomas, 2 ovarian cysts, and 3 luteomas were distinguished. The incidence of malignant tumors in mice to which trichlorfon and dimethoate had been given was 5/14 and 5/19, respectively.

74-0871. Negru, D.; Popescu, S. (Author address not given). **Experiences sur l'association medicamenteuse Neguvon-silicofluorure de sodium. [Tests with a Neguvon-sodium silicofluoride combination.]** *Arch. Vet. 7(1-2): 103-111; 1970.* (10 references) (French)

The acute oral toxicity of combinations of Neguvon (trichlorfon) with sodium silicofluoride was studied in albino mice and swine. The simultaneous administration of trichlorfon and sodium silicofluroide in a dose of 0.03 g/kg body weight to albino mice increased the LD50 value of trichlorfon from 0.66 g/kg to 1.24 g/kg, i.e., decreased the oral toxicity of trichlorfon by 1.9 times. No symptoms of poisoning were noted in pigs to which 0.050 g/kg doses of trichlorfon and sodium silicofluoride were administered daily for 1-3 days for the control of helminths and sarcoptic mange.

74-0872. Michalek, H.; Bonavoglia, F. (Dept. Therap. Chem., Ist. Superiore Sanita, Rome, Italy). **Effects of obidoxime on content and synthesis of brain acetylcholine in DFP intoxicated rats.** *Biochem. Pharmacol. 22(23): 3124-3127; 1973.* (7 references)

Whole brain of rats treated with 1.5 mg/kg DFP and sacrificed 90 min. later showed a 58% elevation of ACh content in comparison to controls. This elevation was blocked by treatment with obidoxime just before and after DFP administration. No difference was observed in the synthesis of ACh by whole brain in vitro between DFP-treated and DFP plus obidoxime-treated rats. A 63% elevation in cerebral cortex ACh was observed in DPT-treated animals and this was also blocked by obidoxime administration. Neither DFP nor obidoxime treatment affected in vitro synthesis of ACh in the cerebral cortex. The peripheral action of obidoxime may be responsible for the reduction of ACh content in the brain produced by this compound.

74-0873. Manna, G. K.; Das, P. K. (Dept. Zool., Univ. Kalyani, Kalyani, W. Bengal, India). **Effect of two chemosterilants apholate and hempa on the bone-marrow chromosomes of mice.** *Can. J. Genet. Cytol. 15(3): 451-459; 1973.* (27 references)

The aberration frequency in mouse bone-marrow chromosomes of control mice or those injected with hempa at 15 mg/kg was negligible, while a peak frequency of 29% was observed 24 hr after injection of 15 mg/kg apholate. Some degree of aberration was found at all intervals between 1 hr and 120 hr, but none at 15 min. or at 144 hr. Gaps, constrictions, fragments of unknown origin, centromeric dissociations, subchromatid breaks, chromatid breaks, anisochromatid breaks, isochromatid or chromosome breaks, and exchanges were observed. Chromatid breaks were most common and occurred most frequently in chromosome groups I and II. The breaks were probably due to some direct action of the aziridine groups.

74-0874. Mills, J. T.; Alley, B. P. (Res. Sta., Agr. Canada, Winnipeg, Manitoba R3T 2M9, Canada). **Interactions between biotic components in soils and their modification by management practices in Canada: a review.** *Can. J. Plant Sci. 53(3): 425-441; 1973.* (123 references)

Soil microfloral and faunal components are vitally concerned with soil fertility, plant growth, and decomposition of plant residues and pesticides and are interrelated in a complex manner. Interactions occurring between dominant soil biotic components have been compiled and each interaction rated according to its importance in the literature. This review is intended as a framework on which further information can be superimposed and the relative importance of interactions revised. The general format used is as follows: functions of major biotic components; their interactions; the effects of management practices, excluding pesticides, on the components; and the effects of pesticides. A concluding section suggests where further research is needed. In particular, information is required on the effects of Collembola, mites, enchytraeid worms, and protozoa on actinomycetes; of discing and severe winter conditions on faunal and microfloral populations; of seed treatment fungicides on soil fauna; of lindane, dasanit (fensulfothion), furadan (carbofuran), and lannate (methomyl) insecticides on fungi, bacteria, and actinomycetes; of lindane and diazinon on nematodes; and of dasanit, furadan, and lannate on earthworms, enchytraeid worms, Collembola, and mites. Also, more information is needed on the effects of barban, diallate, and triallate herbicides on the major soil biota and of MCPA on the soil fauna. (Author abstract by permission)

74-0875. Bedwell, W.; Anderson, W. H. (Dept. of Med., Univ. of Louisville Sch. of Med., Louisville, KY). **Paraquat and oxygen effects on surfactant.** *Clin. Res. 22(1): 44A; 1974.*

The effect of paraquat and oxygen on pulmonary surfactant was studied in vitro. A moving canine surfactant system was exposed to paraquat and/or oxygen for 30 min at 37°C, after which surface activity was determined. Neither 0.5 nor 1.0 cc of paraquat in 25 cc of solution displayed hysteresis or affected the activity of a saline solution. However, when similar amounts were incubated with the surfactant preparation, marked changes occurred in the area of the hysteresis curve. Although oxygen did not affect the surface activity or the area of the hysteresis curve, it produced a significant change when added to 0.5 cc of paraquat. Physical-chemical alterations with increased intermolecular distance in the surface film due to oxidation by paraquat would explain these results.

74-0876. Cavanagh, J. B. (M.R.C. Res. Group Appl. Neurobiol., Inst. Neurol., London, England). **Peripheral neuropathy caused by chemical agents.** *Crit. Rev. Toxicol. 2(3): 365-417; 1973.* (366 references)

A wide range of chemical agents which affect the neuron cause degenerative changes primarily in the distal parts of the cell. Distal symptoms are often the rule in thallium neuropathy, and recovery is consequently rapid. With large doses of organophosphates there is often involvement of more proximal regions of the nerves and slow recovery. Degeneration of the whole nerve fiber, probably due to disorganization of the protein synthetic apparatus, results from methyl mercury poisoning. A distal motor and sensory dying back are indicated by clinical symptoms of chronic carbon disulfide poisoning. Inhibition of pyridoxal phosphate metabolism may be responsible for some of the effects of carbon disulfide, as well as disulfiram and DEDTC. Distal dying back is also most characteristic of arsenic poisoning. Although less information is available on lead neuropathy, this agent apparently acts primarily on the sheath cells.

74-0877. Didier, R.; Lutz-Ostertag, Y. (Lab. Biol. Anim., Aubiere, France). **Action de la Simazine sur le tractus genital de l'embryon de Poulet et de Caille in vivo et in vitro. [Effect of simazine on the genital tract of the chicken and quail embryo in vivo and in vitro.]** *C. R. Soc. Biol. 166(12): 1691-1693; 1972.* (5 references) (French)

Chicken and quail eggs were sprayed with 0.5, 0.7, 1, and 1.5% aqueous solutions of simazine, and chicken and quail embryonal gonads were incubated in a culture medium containing simazine to study the effect of this pesticide on the genital tract. The in vivo experiments revealed reduced size, granulation, vacuolation of the interstitial tissue, thickening of the albuginea, partial hypertrophy, and reduced number of gonocytes in male chicken and quail embryos incubated even with the lowest simazine concentration. Intersexuality, reduced fertility, or sterility of the testicles was determined. Partial absence of the cortex, vacuolation, hypertrophy and degeneration of the gonocytes, and inhibited regression of the cephalocaudal portion of the Mullerian duct were observed in female chicken and quail embryos. Similar changes in male and female genitals were observed in cultured embryonal gonads.

74-0878. Meiniel, R. (Univ. de Clermont, Lab. de Biol. Animale, Aubiere, France). **Malformations squelettiques axiales chez les embryons de Poulet et de Caille issus d'oeufs traites par le parathion a differents stades de l'incubation. [Axial sketetal malformations in embryos of chicken and quail hatched from eggs treated with parathion at various stages of incubation.]** *C. R. Soc. Biol. 167(3-4): 459-462; 1973.* (15 references) (French)

Axial skeletal malformations were studied in chicken and quail embryos after treatment of non-incubated and incubated eggs with parathion. Non-

incubated eggs were immersed for 30 sec in an acetone solution containing 20% of a 10% commercial parathion preparation. Single 0.25-1 mg doses of parathion were injected into the vitellum of both non-incubated and incubated eggs on days 2, 5, 6, 7, 8, and 10 of incubation in chicken eggs and on days 2, 4, 6, 8, and 11 of incubation in quail embryos. Chicken embryos immersed or injected before or on the 1st and 2nd days of incubation were histologically normal during the first 4 days of incubation, but anomalies in the cervical curvature between the rhombocephalus and the embryonal limbs appeared by the 110th hour of incubation in chickens and by the 5th day in quail embryos. Similar malformations developed in embryos treated at more advanced stages of the embryogenesis 2 to 3 days after treatment. Compression of the vertebrae in the craniocaudal direction and malformation of the vertebral musculature were observed in embryos treated on the 6th day (quail) and on the 5th day (chicken) and later. The degree of malformations was reduced with the advancement of embryogenesis. However, chicken embryos treated on the 16th day and quail embryos treated on the 14th day of incubation were susceptible to vertebral malformations.

74-0879. Martin, P. N.; Chaisemartin, C.; Bernard, M. (Inst. de Pathol. Comparee et Experimentale du Limousin, Fac. des Sciences, Limoges, France). **Dynamique du 14C *p,p'*-DDT chez *Astacus leptodactylus*. [Dynamics of ^{14}C-labeled *p,p'*-DDT in *Astacus leptodactylus*.]** *C. R. Soc. Biol. 167(5): 728-732; 1973.* (6 references) (French)

The dynamics of ^{14}C-labeled *p,p'*-DDT was studied in the crustacean *Astacus leptodactylus* kept in water with 50μg of *p,p'*-DDT per liter or administered 10 μg/g injection of *p,p'*-DDT through the epimeron. During the prelethal period, one specimen weighing 6.8 g incorporated 31.8 μg of *p,p'*-DDT, nearly two thirds of the original dose. The amount adsorbed on the exoskeletal surface and the branchial surface was 9.6 μg. *p,p'*-DDT was accumulated mainly in the hepatopancreas, the ovary, branchi, cerebroid ganglions, the digestive tract, the muscles, and on the exoskeletal surface. The final DDT concentration on the branchi was 242 times higher than in the water. Following intrahemocoelic injection of *p,p'*-DDT, the hemolymphatic *p,p'*-DDT concentration rapidly decreased from 10 μg/ml measured 10 min after injection. Negligible rate of urinary and branchial excretion of *p,p'*-DDT was observed.

74-0880. Motooka, P. S. (North Carolina State Univ., Raleigh, NC). **Uptake, translocation, and metabolism of Sandoz 6706 in soybean and sicklepod.** *Diss. Abstr. Int. 34(6): 2414B; 1973.*

The uptake, translocation, and metabolism of Sandoz 6706 were investigated to determine the basis for selectivity between the relatively tolerant soybean plant and the relatively susceptible weed, sicklepod. Short-term (24 hr) and long-term (8 days) studies were performed on plants in liquid culture. Herbicide uptake was proportional to concentration in the nutrient solution. Two replicate plants were frozen, chopped, and extracted with hot methanol; the herbicide and its derivatives were partitioned and identified by thin layer chromatography and measured by liquid scintillation spectrometry. Soybeans metabolized 6706 by demethylation to the desmethyl analog, 5-amino-4-chloro-2(α,α,α-trifluoro-*m*-tolyl)-3(2H)-pyridazinone (9774), whereas sicklepod was much less efficient. Another transformation pathway was apparent in the roots of both species, possibly activated by a high concentration of the herbicide. The derivative of this pathway was not identified, but it was obviously not derived from the demethylation of 6706. Differences in ability to metabolize the herbicide appeared to account for differences in susceptibility of plants. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 73-29,565).

74-0881. Silvestri, R. (Univ. of Florida, Gainesville, FL). **Role of plasma in the inactivation of paraoxon in different species of laboratory and domestic animals and in man.** *Diss. Abstr. Int. 34(6): 2827B; 1973.*

Plasmas from man and eight animal species varied significantly in ability to inactivate paraoxon in vitro. The major part of the inactivation of paraoxon by plasma occurred very rapidly, indicating that inactivation could mainly be due to nonenzymatic binding of the organophosphate to plasma components. Enzymatic inactivation of paraoxon by plasma was also observed. Commercial preparations of plasma albumin from different animal species bound paraoxon reversibly to a certain extent. Plasma cholinesterase appeared not to be involved in activation of paraoxon, whereas A- and B-esterase are involved. Treatment of rabbits with two microsomal enzyme inducers, phenobarbital and DDT, did not alter the ability of the plasma to inactivate paraoxon. Phenobarbital did not affect rat plasma, whereas DDT significantly increased the capacity of rat plasma to inactivate paraoxon. Both phenobarbital and DDT significantly increased the ability of mouse plasma to inactivate the organophosphate. The changes in plasma activity against paraoxon in rats and mice appeared to be correlated, at least partially, with opposite effects of the inducers on the A- and B-esterase activities of the plasma: a decrease in the A-esterases and an increase in the B-esterases. Studies on toxicity of paraoxon infused by jugular and portal routes showed that liver has a considerable capacity to inactivate paraoxon. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No 73-29,212.)

74-0882. Fletcher, M. R. (Washington State Univ., Seattle, WA). **Effects of hexachlorobenzene on Japanese quail (*Coturnix coturnix japonica*).** *Diss. Abstr. Int. 34(6): 3007B; 1973.*

The presence of hexachlorobenzene, widely used as a fungicide, has been reported in animal tissues in Canada, the Netherlands, Germany, and the United States in recent years. Japanese quail were fed ^{14}C-HCB at 0, 1, 5, 20, and 80 ppm in the diet for three periods of 2 weeks each. Liquid scintillation counting of tissues showed highest HCB residues in adipose tissue and lowest in brain and muscle tissue. Dose and time of dose were the most significant factors affecting tissue residues. Adjusted liver weights of males and females showed a significant positive linear correlation with increasing dietary levels. Mean egg production was significantly lower in the 80 ppm group, whereas hatchability and fertility of eggs showed a slight decrease at 6 weeks. Doses of 80 ppm for six weeks did not affect eggshell thickness index. Egg yolk residues appeared to have reached equilibrium by the end of the study. Biological half-life of HCB ranged from 12 days in female adipose tissue to 70 days in male liver tissue. A decrease of 90% or more in HCB residues occurred by 100 days. The solubility of HCB in water was estimated at 0.24 ± 0.09 ppb. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 73-29,276.)

74-0883. Vassilev, G. N.; Raschev, Z. D.; Dimitrov, T. I.; Driankova, M. M. ("Metodi Popov" Inst. Plant Physiol., Bulg. Acad. Sci., Sofia, Bulgaria). **Biologische Aktivitaet eines neuen Praeparats mit Retardantwirkung. [Biological activity of a new preparation with a retardant effect.]** *Dokl. Bolg. Akad. Nauk 26(4): 513-516; 1973.* (10 references) (German)

The acute and subacute toxicity of ortho-phenylthiourea benzoiate, a new preparation with growth retardant effect, was studied with Wistar rats. The acute poisoning tests were conducted with doses of 500, 2,000, and 8,000 mg per kg of body weight. The animals were given daily oral doses of 250 mg/kg body weight for 25 consecutive days. No lethality whatsoever occurred. Since the LD50 was determined to be beyond 8,000 mg/kg, the preparation is rated as non-toxic. However, the subacute tests revealed significant reduction of the hepatic catalase and glutamate oxalacetate transaminase activity, slight reduction in the alkaline phosphatase activity, a significant increase in the succinate dehydrogenase and glutamate pyruvate activities. The blood serum magnesium level was reduced by nearly 50% and the calcium level increased by about 3 times.

74-0884. Shugayev, V. A. (Author address not given). **Vliyaniye glyutaminovoy kisloty na toksichnost' ftoristogo natriya. [The effect of glutamic acid on the toxicity of sodium fluoride.]** *Farmakol. Toksikol. (Moscow) 36(4): 449-451; 1973.* (Russian)

The effect of glutamic acid on the toxicity of sodium fluoride was studied in mice and rats administered daily oral doses of 10 mg of sodium fluoride and 500 mg of glutamic acid per kg of body weight. A single 500 mg/kg dose of glutamic acid potentiated the toxic effect of sodium fluoride when administered 10-20 min after oral administration of 125 mg of sodium fluoride per kg. A preliminary introduction of glutamic acid 30 min before or twice (24 hr and immediately before poisoning) did not modify the toxicity of NaF. A fourfold prophylactic introduction of glutamic acid reduced the toxicity of NaF by about 50%. The toxic action of NaF was considerably weakened by a concomitant reintroduction of glutamic acid and NaF in partial doses. Slowdown in weight gain, lowered rectal temperature and oxygen demand, increased blood lactic acid level, reduced serum alkaline phosphatase activity, and inhibited hepatic and cerebral succinate dehydrogenase activity were observed in animals treated with sodium fluoride.

74-0885. Komisarenko, V. P.; Tyulyenyev, V. I.; Mikosha, O. S. (Kiev Inst. Endocrinology and Metabolism, Kiev, USSR). **Doslidzhennya vplyvu *o,p'*-DDD na ATFazun aktyvnist' ta nabryakannya mitokhondrii pechinky i nyrok. [A study of the effect of *o,p'*-DDD on ATPase activity and swelling of renal and hepatic mitochondria.]** *Fiziol. Zh. (Kiev) 19(2): 195-199; 1973.* (12 references) (Ukrainian)

Dogs received 50 mg of *o,p'*-DDD/kg of body weight for 14 days; guinea pigs received 100 mg/kg for 20-22 days. In dogs Mg^{+2} dependent ATPase did not change significantly, but Na^{+} and K^{+} dependent ATPase decreased in the kidneys. Mg^{+2} dependent ATPase was inhibited to a greater extent in dogs than in guinea pigs. Na^{+} and K^{+} dependent ATPase was inhibited more by *o,p'*-DDD than Mg^{+2} dependent ATPase in both animals. Renal mitochondria from dogs swelled more than hepatic mitochondria. Since Na^{+} and K^{+} dependent ATPase activity also decreased more in renal mitochondria, a correlation betweeen Na^{+} and K^{+} dependent ATPase activity and swelling of renal mitochondria was noted. No differences were noted between the swelling of renal and hepatic mitochondria from guinea pigs.

74-0886. Dyshovs'ki, Kh. D.; Kahan, Yu. S.; Kovtun, S. D.; Kokshar'ova, N. N.; Rodionov, H. O.; Sasinovych, L. M. (Dept. Exp. Toxicol., All-Union Inst. Hygiene and Toxicol. Pesticides, Polymers and Plastics, Kiev, USSR). **Pro fiziolohichnyi mekhanism terapevtychnoho efektu dypiroksymu. [On the physiological mechanizm of the therapeutic effects of dipyroxime.]** *Fiziol. Zh. (Kiev) 19(3): 310-314; 1973.* (7 references) (Ukrainian)

A histochemical and electromyographic analysis of the mechanism of action of dipyroxime was performed

in albino rats poisoned with DDVP (dichlorvos) and chlorophos (trichlorfon). Cholinesterase (ChE) activity was detected in rats treated with dipyroxime and atropine after DDVP and chlorophos poisoning. In DDVP poisoned rats treated with dipyroxime alone, the highest ChE activity level was noted in the caudate nucleus (41.1 %). ChE activity decreased by 69.9-98.4 % in the spinal cord and brain. Dipyroxime partially restored ChE activity in the brain, spinal cord, and striated muscles by improving transfer of excitation of neuromuscular synapses. The mechanism of action of DDVP involves acetyl-ChE inhibition and disturbance of the function of other components of neuromuscular synapses. Dipyroxime is recommended for treating acute DDVP and chlorophos poisoning.

74-0887. Jonecko, U.; Jonecko, A. (Miners' Hosp., Zabrze-Biskupice, Poland). **Histochemical and histological studies of severe experimental poisoning with organophosphoric compound Metasystox (Bayer).** *Folia Histochem. Cytochem. 10(2): 201; 1973.*

Histochemical examinations were made of the skeletal muscles, lungs, intestines, livers, and brains of 25 mice lethally poisoned with a single i.p. injection (30 mg/kg) of methyl demeton. Histochemically detectable esterase activity in the motor end plates of the muscles was abolished, and nonspecific esterase activity was suppressed. The activities of lactate dehydrogenase and lipoamide dehydrogenase (NADH) were also inhibited, while the activities of ATPase and acid and alkaline phosphatases were not. The PAS reaction revealed a loss of liver glycogen. The bronchi and bronchioles of the lungs contracted and became full of serous fluid; their occlusion was reflected in the dilatation of the alveolar ducts and alveoli. Border emphysema developed and hemorrhages and edema occurred in places. In animals that survived longer pulmonary edema and hemorrhagic changes developed; the liver revealed marked parenchymatous degeneration and passive hyperemia. Abolition of the activity of the specific and nonspecific esterases is specific for inhibitors of organophosphoric compound type.

74-0888. Wallnoefer, P. (Bayerische Landesanstalt fuer Bodenkultur und Plfanzenbau, Munich, Germany). **Das Verhalten von Pestiziden als Umweltchemikalien in der Natur am Beispiel einiger Phenylamide. [The behavior of pesticides as environemtal chemicals in nature, as exemplified by some phenylamides.]** *Gesunde Pflanz. 24(11): 180-183; 1972.* (18 references) (German)

The mechanism of the microbial metabolism and soil degradation of some herbicides and fungicides was studied in model experiments using *N*-phenylcarbamic acid esters, *N*-methoxyphenylureas, and acylanilides. Metabolism of carboxin, chlorobenzoic acid anilide, tolylic acid anilide, and pyranic acid anilide by *Mucoraceae* and *Rhizopus* species was observed. Various *Mucoraceae* and *Rhizopus* species were able to oxidize these compounds at the acyl and aniline radicals. The side chains of the acid radicals are preferentially hydroxylated, while sulfur in carboxin is oxidized to sulfoxide and sulfone. The anilides of 2-methylbenzoic acid and 2-cholorobenzoic acid are hydroxylated on the aniline moieties. The extent of such metabolic processes under aerobic conditions ranged from 10% to 90%. Acylanilides, and possibly also *N*-phenylcarbamic acid esters, were attacked by *Bacillus sphaericus* at the amide bonds. However, *B. sphaericus* is unable to further metabolize the anilines resulting from the metabolism of the phenylamides. Anilines can be further decomposed by other microorganisms of the soil, e.g., by oxidative dimerization to carbon dioxide and ammonia. The free acids from the decomposition of phenylamides such as monalide and propham are easily inactivated by soil microorganisms, while *B. sphaericus* is unable to degrade the acids formed from acylanilides.

74-0889. Izmaylova, L. D. (Med. Inst., Tashkent, USSR). **Materialy po gigiyenicheskoy i toksikologicheskoy kharakteristika novogo defolianta akrofola. [Data on the hygienic and toxicologic characteristics of a new defoliant, acrofol.]** *Gig. Tr. Prof. Zabol. 16(11): 48-50; 1972.* (5 references) (Russian)

Hygienic and toxicologic characteristics of acrofol, a sodium salt of *cis*-3-chloroacrylic acid, were determined on the basis of investigations of working conditions prevailing during manufacture and application; toxicologic studies were also performed on albino mice, albino rats, and rabbits. Acrofol concentrations of 1.2-2.7 mg/m^3 increased minimum arterial pressure by 12%, pulse rate by 7%, and blood catalase activity by 68.8%, and reduced the whole blood sulfhydryl level by 29% in workers occupationally exposed. The oral LD50 values for rats, mice, and rabbits are 520, 595, and 400 mg/kg. The LD50 for skin application in rats was 3,900 mg/kg. The LC50 and limit concentrations for rats are 150 and 34 mg/m^3, respectively. Acrofol was able to penetrate through intact skin and the mucosa of the eye. Depression, anorexia, and irritability were found initially in rats and rabbits exposed chronically to a concentration of 26.3 mg/m^3, but these symptoms disappeared after the first 1.5 to 2 months. Increased leukocyte level, reduced serum sulfhydryl group content, and lowering of the threshold of neuromuscular excitability were determined. Increased leukocyte level, increased catalase activity followed by its reduction, and reduced serum sulfhydryl group level were observed in rats and rabbits that exhibited no symptoms of poisoning during a 4-month exposure to an acrofol concentration of 5 mg/m^3. The maximum allowable workplace concentration of acrofol is recommended as 0.5 mg/m^3. Inhalation of and direct contact with acrofol should be avoided.

74-0890. Bhardwaj, R. M.; Gautam, O. P.; Bhardwaj, S. (Coll. Vet. Med., Haryana Agr. Univ., Hissar, India). **Behavior of cholinesterase in malathion toxicity.** *Haryana Agr. Univ. J. Res. 1(3): 90-96; 1971.* (19 references)

Peak inhibition of plasma ChE in rats occurred at 12, 48, and 30 hr after administration of malathion at 25, 50, and 75% LD50, respectively. A time course similar to that observed for plasma ChE inhibition was noted with erythrocyte ChE inhibition in 25% LD50 rats; i.e., inhibition peaked at about 12 hrs, declined, and again rose between 48 and 72 hr. At 50 and 75% erythrocyte ChE showed an initial increase in activity followed by a decline. Inhibition of erythrocyte ChE was greater than that of plasma ChE.

74-0891. Hasegawa, M.; Ono, T.; Karashimada, T.; Sato, H.; Kameyama, K.; Kinoshita, Y.; Ogawa, E.; Kitagaki, T. (Hokkaido Inst. of Pub. Health, Sapporo, Japan). **[Studies on the safety of the newly introduced organophosphorus insecticide, chlorpyrifos-methyl, Part 1. Acute toxicity of chlorpyrifos-methyl in rats and mice.]** *Hokkaidoritsu Eisei Kenkyusho-Ho (Rep. Hokkaido Inst. Pub. Health) 23: 57-61; 1973.* (3 references) (Japanese)

The acute oral and dermal toxicities of chlorpyrifos-methyl (Dowco-214) to rat and mouse were determined using material with a purity of 99.6%. The animals used were male and female Wistar rats, six-seven weeks old, and male and female ddy-S mice of similar ages. A suspension of the insecticide in a 1% aqueous solution of carboxymethyl cellulose (CMC) or a solution of the insecticide in corn oil was administered via stomach tube at a dose of 1 ml/10 g b.w. Dermal application was carried out by painting a suspension of the insecticide in 2% CMC aqueous solution on the shaved back of the animal at a dose of 0.1 ml/10 g b.w. on a 2 X 2 cm area. Using the dose-mortality relationship following the method of Van der Waerden, the following LD50 values were obtained: LD50, acute oral: 3,733 and 3,597 mg/Kg respectively, male and female rat (in CMC aq); LD50, acute oral: 2,472 and 1,828 mg/Kg respectively, male and female rat (in corn oil); LD50, acute oral: 2,254 and 2,032 mg/Kg respectively, male and female mouse (in corn oil); LD50, acute dermal: > 4,827 mg/Kg for male and female rat (in CMC aq); LD50, acute dermal: > 3,713 mg/Kg for male and female rat (in corn oil); LD50, acute dermal: > 2,856 mg/Kg for male and female mouse (in CMC aq). The suspension of the insecticide in 1% aqueous CMC solution could not be administered to the mouse due to precipitation of the active ingredient in the stomach tube. Acute symptoms in mice and rats given chlorpyrifos-methyl were essentially the same as those with other organophosphorus pesticides.

74-0892. Hasegawa, M.; Ono, T.; Karashimada, T.; Sato, H.; Kameyama, K.; Kinoshita, Y.; Ogawa, E.; Kobayashi, H.; Sonoda, M.; Kitagaki, T. (Hokkaido Inst. Pub. Health, Sapporo, Japan). **[Studies on the safety of the newly introduced organophosphorus insecticide, chlorpyrifos-methyl, Part 2. Subacute (6 months) toxicity of chlorpyrifos-methyl in rats.]** *Hokkaidoritsu Eisei Kenkyusho-Ho (Rep. Hokkaido Inst. Pub. Health) 23: 62-70; 1973.* (10 references) (Japanese)

To investigate the subacute toxicity of chlorpyrifos-methyl in rats, standard diets containing 0.5, 1, 5, 10, 20, 30, 40, or 100 ppm of the insecticide (purity 99.6%) were fed for six months to male and female Wistar rats ad lib. The body weight averaged 100 g and the feed intake, 20 g/day; the acute p.o. LD50 (average of male and female) was taken as 2150 mg/kg. No significant differences were noted between the test group and controls in symptoms, mortality, feed intake, weight gain, organ weights, and urinalysis. No statistically significant difference was noted between controls and groups given less than 40 ppm of the insecticide in the results of hematological, biochemical, and pathohistological examinations. Serum and erythrocyte ChE activity of the groups given more than 20 ppm of the insecticide showed statistically significant decreases at one, three, and six months of dosing. Using the ChE activity as the intoxication index, it was presumed that the maximum no-effect dose, the minimum effective dose, and the definitely effective dose for rat were, respectively, 1.1 mg/kg/day, 2.3 mg/kg/day, and 3.4 mg/kg/day, corresponding to concentrations of the insecticide in the diet of 10, 20, and 30 ppm.

74-0893. Hasegawa, M.; Ono, T.; Karashimada, T.; Sato, H.; Kameyama, K.; Kinoshita, Y.; Ogawa, E.; Kobayashi, H.; Sonoda, M.; Kitagaki, T. (Hokkaido Inst. Pub. Health, Sapporo, Japan). **[Studies on the safety of the newly introduced organophosphorus insecticide, chlorpyrifos-methyl, Part 3. Subacute (six months) toxicity of chlorpyrifos-methyl in mice.]** *Hokkaidoritsu Eisei Kenkyusho-Ho (Rep. Hokkaido Inst. Pub. Health) 23: 71-80; 1973.* (9 references) (Japanese)

The method used for determining subacute toxicity of chlorpyrifos-methyl to mice was the same as that described in the preceding report (Abstract no. 74-0892). Male and female ddy-S strain mice, 5 weeks old, were used in the experiment. No statistically significant difference was noted between the test group and controls in terms of symptoms, mortality, feed intake, weight gain, organ weights, and urinalysis. No statistically significant abnormality was seen in the groups given less than 40 ppm in the diet in terms of hematologic, biochemical, and pathohistological examinations. Plasma and erythrocyte ChE activities were lower in the groups given doses in excess of 20 ppm than in controls; however, brain ChE activity decreased to 70% the control level in males given 40 and 100 ppm in the diet and in females given 40 ppm. Using the ChE activity as index, it was presumed that the maximum no-effect dose, the minimum effective dose, and the definitely

effective dose of the insecticide for mouse were, respectively, 1.0 mg/kg/day, 2.1 mg/kg/day, and 4.2 mg/kg/day. These levels correspond to insecticide levels in the feed of 5, 10, and 20 ppm.

74-0894. Schrogie, J. J. (Author address not given). **Interrelationships between metabolism of drugs and sex steroids in the liver.** *IN: Human Reproduction. Conception and Contraception. Harper & Row, Hagerstown, MD, 1973, pp. 529-538.* (28 references)

Enzymes which metabolize drugs, pesticides, and steroids have a number of similarities including localization in liver microsomes, requirement for TPNH and oxygen, inducibility, susceptibility to SKF 525-A or chlorthion, and sex and strain differences in activity. DDT, chlordane, and other pesticides can increase the rate of metabolism and increase or decrease the pharmacologic effects of drugs, depending on the nature of metabolic products. Evidence of increased estrogen metabolism is seen in rats after administration of DDT or chlordane. Nutritional state of the animal influences the extent of enzyme activity.

74-0895. Grigorowa, R.; Binnewies, S. (Deut. Zentralins. fuer Arbeitsmed., Fachbereich Industrietoxikol., Berlin-Lichtenberg, DDR). **Ueber die kombinierte Wirkung von phosphororganischen Pestiziden und erhoehter Umgebungstemperatur in inhalatorischen Kurzversuchen an Ratten. I. Toxikologische Aspekte. [Combined action of organophosphorus pesticides and increased environmental temperature in short-term inhalation studies on rats. Part I: Toxicological aspects.]** *Int. Arch. Arbeitsmed. 31(14): 295-307; 1973.* (22 references) (German)

The combined action of thinox, dimethoate, and wofatox (methyl parathion) with elevated ambient temperature (35°C at a relative humidity of 50%) was investigated in subacute, 8-day inhalation tests on male rats. The concentrations of tinox, dimethoate, and wofatox in the inhalation chambers were 4.2 mg/m^3, 16 mg/m^3, and 0.8 mg/m^3. Thermal stress increased the toxicity of all three pesticides, especially tinox. The deviations from the control group were most pronounced on the second and fourth days of the tinox experiment, after which some parameters (relative organ weights, cholinesterase activity, total protein, and protein fractions in the serum, pituitary ACTH activity, rectal temperature) seemed to normalize. The changes observed in the animals treated with dimethoate were similar to those in the tinox-exposed group though less pronounced. Increased cholinesterase inhibition, expecially under thermal stress, was observed in the wofatox-exposed group after the eighth day. Body temperature, cell respiration, and cholinesterase activity were correlated. Tinox and dimethoate increased and wofatox decreased both the cellular respiration and the cholinesterase activity.

74-0896. Gohlke, R.; Grigorowa, R. (Deutsches Zentralinst. fuer Arbeitsmed., Fachbereich Industrietoxikol., Noeldnerstrasse 40-42, Berlin-Lichtenberg, DDR). **Ueber die kombinierte Wirkung von phosphororganischen Pestiziden und erhoehter Umgebungstemperatur in inhalatorischen Kurzversuchen an Ratten. II. Histologische, histochemische und morphometrische Untersuchungen. [Combined action of organophosphorus pesticides and increased environmental temperature in short-term inhalation studies on rats. Part II. Histological, histochemical and morphometric studies.** *Int. Arch. Arbeitsmed. 31(4): 309-327; 1973.* (17 references) (German)

The toxic effects of tinox, dimethoate, and wofatox (methyl parathion), inhaled in quantities close to the chronic threshold limit doses at elevated ambient temperatures (35°C) were investigated in a 10-day experiment on rats. Tinox, manufactured in East Germany, is a mixture of the thiolo and thiono isomers of *O,O*-dimethyl 2-methylmercaptoethyl thiophosphate. Pesticide-treated and heat-exposed animals displayed histologic changes in lungs, liver, and thyroid glands, histochemical changes in the liver; morphometric changes in the thyroid glands; and changes in radioiodine uptake by the thyroid. Heat intensified the promotion of liver fatty degeneration by tinox. Heat also enhanced the stimulation of acid phosphatase activity and the decrease in relative weight of the thyroid gland as well as the changes in thyroid epithelium produced by both dimethoate and wofatox. Heat exposure in combination with tinox caused liver necrosis in some cases. The morphologic findings were consistent with those of previous subacute experiments lasting up to four weeks where the same pesticides were administered orally. In the short-term experiment, however, the effects of heat were more intense.

74-0897. Terracini, B.; Testa, M. C.; Cabral, J. R.; Day, N. (Inst. Nazionale Studio Cura Tumori, 20133 Milan, Italy). **The effects of long-term feeding of DDT to Balb/c mice.** *Int. J. Cancer 11(3): 747-764; 1973.* (40 references)

In a multigenerational study 250 ppm DDT produced liver-cell tumors in 44% of the female mice of the parent generation and 74% of the F_1 generation. Survival in males was poor due to fighting. The highest dose level of DDT (250 ppm) produced deaths following convulsions. No liver-cell tumors were found with lower levels of DDT, but malignant lymphomas occurred in about 50% of mice given diet containing 0, 2, or 20 ppm. A lower incidence of lymphomas was noted in the 250 ppm colonies, and the incidence of tumors at sites other than liver, lymphatic system, and lung was lowest in the 250 ppm DDT colonies.

74-0898. Chulakov, Sh. A.; Zharasov, Sh. U. (Inst. Soil Sci., Acad. Sci. Kazakh SSR, USSR). **Biologicheskaya**

aktivnost' yuzhnykh pochv Kazakhstana pri primenenii gerbitsidov. [Biological activity of southern soils of Kazakhstan during herbicide use.] *Izv. Akad. Nauk Kaz. SSR Ser. Biol. 11(2): 7-13; 1973.* (13 references) (Russian)

The effects of the herbicides lenacil, ronit (Ro-Neet), yalan (molinate), sodium TCA, and chlorazone were studied on the biological activity of southern soils of Kazakhstan. Ronit, applied in a dose of 8 kg/ha, slightly reduced the populations of fungi and actinomycetes temporarily while the other pesticides did not cause noteworthy changes in the microorganism counts in the soil. Fungi, actinomycetes, and bacteria were most susceptible to ronit and yalan doses exceeding the recommended doses by 8 to 10 times. Sporiferous bacteria, fungi, and actinomycetes were most susceptible to yalan and ronit. Actinomycetes, *Trichoderma, Penicillium, Fusarium,* and *Curvularia* species intensely decomposed sodium TCA; sporiferous bacteria, *Azotobacter, Curvularia,* and *Penicillium* species decomposed chlorazone. The biologic activity of the soils treated with the herbicides was close to the control level.

74-0899. Fahmy, M. A. H.; Chiu, Y. C.; Fukuto, T. R.* (Dept. Entomol., Div. Toxicol. Physiol., Univ. California, Riverside, CA 92502). **Selective toxicity of *N*-substituted biscarbamoyl sulfides.** *J. Agr. Food Chem. 22(1): 59-62; 1974.* (12 references)

The reaction between sulfur monochloride and insecticidal methylcarbamate esters in the presence of pyridine gave as the principal product the corresponding *N*-substituted biscarbamoyl sulfide. Compared to the original methylcarbamate esters, the biscarbamoyl sulfides were substantially less toxic to the white mouse but were still highly effective insecticides, particularly against mosquito larvae. One of the compounds, bisaldicarb sulfide, was significantly superior to aldicarb as a systemic insecticide in greenhouse tests. In all cases, the biscarbamoyl sulfides were less effective in inhibiting both insect and mammalian cholinesterase than the methylcarbamate esters. A rationale for the selective action of these compounds is presented. (Author abstract reprinted by permission of the American Chemical Society)

74-0900. Chang, H.; Rip, J. W.; Cherry, J. H. (Dept. of Horticulture, Purdue Univ., Lafeyette, IN 47907). **Effects of phenoxyacetic acids on rat liver tissues.** *J. Agr. Food Chem. 22(1): 62-65; 1974.* (30 references)

No drastic damaging effect was noted when male Long-Evans rats were given 2,4-dichlorophenoxyacetic acid (2,4-D) or 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) equivalent to 2-5 g/kilogram body weight over a 4- to 7-week feeding period. Response to herbicide treatment was dependent on animal age and on the duration of chemical feeding. Based on equal amounts of either chemical fed, animals showed stronger responses to 2,4,5-T than to 2,4-D. Feeding of 2,4,5-T caused an increase in liver fresh weight and dry weight per 100 g of body weight, whereas 2,4-D had little or no effect on liver weight. Herbicide-induced enlargement of the liver was associated with increases in most of the major cellular components on a per liver basis. Glycogen content was 50 to 100% higher in controls. Livers from 2,4,5-T treated animals but not 2,4-D treated animals contained increased quantities of RNA and protein. Total DNA was increased only 10% or less by the treatments, while nuclear DNA content was 15-45% lower in livers from 2,4,5-T-treated animals than those from control and 2,4-D-treated animals. Isolated liver nuclei from both 2,4-D- and 2,4,5-T-fed rats were 20-30% more active in in vitro RNA synthesis than control nuclei. (Author abstract reprinted by permission of the American Chemical Society)

74-0901. Abston, P. A.; Yarbrough, J. D.* (Dept. Zool., Mississippi State Univ., Mississippi State, MS 39762). **The in vivo effects of dietary mirex on hepatic lactic dehydrogenase and glutamic oxaloacetic transaminase levels of the rat.** *J. Agr. Food Chem. 22(1): 66-68; 1974.* (16 references)

Adult male and female Sprague–Dawley rats were fed standard laboratory chow, ad libitum containing mirex in concentrations of 10, 50, 100, and 200 ppm for 4 weeks. Liver homogenates were analyzed for lactic dehydrogenase and glutamic-oxaloacetic transaminase activity. Male liver LDH levels were reduced approximately 50% in the 100 and 200 ppm of mirex exposed animals, as compared to control animals, by 2 weeks of dietary mirex and persisted through the test period. Liver GOT levels showed a steady decrease in activity, exhibiting a 60-65% decrease at the end of the 4-week treatment period. With 10 ppm of dietary mirex, male liver LDH levels showed no significant change during the 4-week period, while liver GOT levels were reduced about 26% at the end of 3 weeks. Female rat liver homogenates exhibited an approximate 24% decrease in LDH levels after 3 weeks of dietary feeding of 100 ppm of mirex, while liver GOT levels were reduced about 35% when compared to control animals at 3 weeks. Female rats fed 50 ppm of mirex showed an approximate 25% reduction of LDH levels and about a 28% decrease in GPT liver levels after 4 weeks of exposure. (Author abstract reprinted by permission of the American Chemical Society)

74-0902. Adams, M.; Coon, F. B.; Poling, C. E. (Nutrition Inst., Agr. Res. Serv., USDA, Beltsville, MD 20705). **Insecticides in the tissues of four generations of rats fed different dietary fats containing a mixture of chlorinated hydrocarbon insecticides.** *J. Agr. Food Chem. 22(1): 69-75; 1974.* (14 references)

From weaning, four generations of male and female rats were fed diets containing different fats and a

mixture of DDT, DDE, DDD (TDE), dieldrin, lindane, BHC, heptachlor epoxide, methoxychlor, and Perthane. DDT, DDD, DDE, and dieldrin were stored in livers and carcasses of weanlings, as well as in livers and body fat of adults. Generation differences were generally small and provided no evidence of a continuing increase with succeeding generations. Differences related to sex were observed in adults but not in weanlings. With DDT, DDE, and DDD the differences between mated males and females of the F_0 through F_2 generations were the reverse of those in unmated rats of the F_3 generation. No such differences were observed with dieldrin. Distribution of DDT and DDE varied with the tissue investigated. Type of dietary fat exerted little influence on tissue content except for a possible interaction of cottonseed oil and dieldrin. (Author abstract reprinted by permission of the American Chemical Society)

74-0903. Palmer, J. S.; Schlinke, J. C. (U.S. Livestock Insects Lab., Agr. Res. Serv., U.S.D.A., Kerrville, TX 78028). **Toxic effects of carbofuran in cattle and sheep.** *J. Amer. Vet. Med. Ass. 162(7): 561-563; 1973.* (8 references)

Carbofuran, a carbamate insecticide and nematocide utilized on field crops, was administered as a single oral dose or as a topical application to 25 cattle of various ages and types and orally to 10 yearling sheep. Signs of toxicosis were induced in both species at dosages that would categorize carbofuran as a highly toxic chemical relative to other agricultural chemicals to which these animals could be exposed. (Author abstract by permission)

74-0904. Schlinke, J. C.; Palmer, J. S. (U. S. Livestock Insects Lab., Agr. Res. Serv., U. S. Dept. of Agr., Kerrville, TX 78028). **Combined effects of phenothiazine and organophosphate insecticides in cattle.** *J. Amer. Vet. Med. Ass. 163(7): 756-758; 1973.* (7 references)

Calves (6-8 months old) were given phenothiazine, either as a single dose or as continuous low-level doses, or both, in amounts recommended for control of internal parasites or of fly larvae that develop in cattle feces. The cattle were then treated initially with one of the following insecticides: malathion, coumaphos, trichlorfon, or ronnel. Approximately one month later, a crotoxyphos/dichlorvos mixture, tetrachlorvinphos, or crotoxyphos were applied as sprays, or crufomate was applied as a pour-on. Finally, 10 weeks later, the calves were treated again with malathion, coumaphos, ronnel, a crotoxyphos/dichlorvos mixture, crotoxyphos, or crufomate. The calves were observed for signs of poisoning, and blood samples were collected for cholinesterase determinations. One calf sprayed with ronnel developed signs of illness attributed to organophosphate poisoning or to a host-parasite reaction. There did not seem to be any potentiation of the toxic effects of these organophosphate insecticides by phenothiazine. (Author abstract by permission)

74-0905. Van Gelder, G. A.; Carson, T. L.; Smith, R. M.; Buck, W. B.; Karas, G. G. (Behavioral Toxicol. Lab., Vet. Diagnostic Lab., Coll. of Vet Med., Iowa State Univ., Ames, IA 50010). **Neurophysiologic and behavioral toxicologic testing to detect subclinical neurologic alterations induced by environmental toxicants.** *J. Amer. Vet. Med. Ass. 163(9): 1033-1035; 1973.* (13 references)

Development of adequate methods for the assessment of the dynamic functioning of the nervous system in the intact organism is one of the major challenges of medical research. Historically, the measurement of reflexes and spontaneous brain electrical activity have been used. More recently, nerve conduction tests and quantitative electromyography have been used in clinical and public health situations. Behavioral toxicology is a relatively new specialty that combines the resources of the experimental psychologist and the toxicologist in determining the deleterious effects of drugs and chemicals on behaviors such as learning or memory. Examples are given of the effects of lead and organophosphorus insecticides on peripheral nerve functioning. Experiments are also reviewed that demonstrate the effect of low-level prenatal exposure to mercury and lead on postnatal behavior. The effect of low-level dieldrin exposure on learning behavior in squirrel monkeys is cited as another example of the recent contribution of behavioral toxicology toward a fuller understanding of the effect of common environmental neurotoxicants on brain functioning. (Author abstract by permission)

74-0906. Palmer, J. S.; Schlinke, J. C. (U. S. Livestock Insects Lab., Agr. Res. Serv., USDA, Kerrville, TX 78028). **Oral toxicity of tributyl phosphorotrithioite, a cotton defoliant, to cattle and sheep.** *J. Amer. Vet. Med. Ass. 163(10): 1172-1174; 1973.* (6 references)

Emulsions of a tributyl phosphorotrithioite formulation are utilized to defoliate cotton plants prior to harvest. Single oral doses (ranging from 25 to 200 mg/kg of body weight) and multiple oral doses (ranging from 2.5 to 25 mg/kg body weight) were administered to 14 cattle and 20 sheep to determine its toxic effects. Depression of blood cholinesterase activity and loss of body weight, with or without diarrhea, were the results most evident after a single exposure or after the cumulative effects of up to 10 daily doses. (Author abstract by permission)

74-0907. Rumsey, T. S.; Samuelson, G.; Bovard, K. P.; Priode, B. M. (U.S.D.A., Ruminant Nutr. Lab., Beltsville, MD 20705). **Placental transfer of DDT in beef cattle.** *J. Anim. Sci. 37(5): 1186-1190; 1973.* (14 references)

DDT residues in fat tissues of stillborn calves from cows fed apple pomace, pomace-corn silage, or corn silage containing DDT averaged 3.5, 2.1, and 1.1 ppm, respectively, levels similar to those found in the cows selected from each group. No relationship was found between the use of pesticide contaminated feed and the

occurrence of stillbirths. A higher percentage of DDE was observed in stillborn calves compared to the dams, but distribution of DDT and TDE among other tissues was similar in dams and calves. Radioactive DDT, injected intravenously in pregnant heifers, decreased rapidly in venous blood from 63% at 1 min. to 16% at 5 min. but declined slowly between 12 and 72 hr. During a period of 14 days, only 7% of the dose was excreted in the urine and 2% in the feces. Initially, a low level was detected in fetal blood, but at 6 hr, fetal and maternal blood appeared to be in equilibrium. Some DDT was present in fetal fat at 3 and 6 hr after injection, but the fetus seemed to be protected from a large portion of the single injected dose because of the rapid movement into the fat of the dam.

74-0908. Hermanutz, R. O.; Mueller, L. H.; Kempfert, K. D. (Nat. Water Qual. Lab., Duluth, MN 55804). **Captan toxicity to fathead minnows (*Pimephales promelas*), bluegills (*Lepomis macrochirus*), and brook trout (*Salvelinus fontinalis*).** *J. Fish. Res. Bd. Can. 30(12): 1811-1817; 1973.* (15 references)

The toxic effects of captan on survival, growth, and reproduction of fathead minnows (*Pimephales promelas*) and on survival of bluegills (*Lepomis macrochirus*) and brook trout (*Salvelinus fontinalis*) were determined in a flow-through system. In a 45-week exposure of fathead minnows, survival and growth were adversely affected at 39.5 μg/liter. Adverse effects on spawning were suspected but not statistically demonstrated at 39.5 and 16.5 μg/liter. The maximum acceptable toxicant concentration (MATC), based on survival and growth, lies between 39.5 and 16.5 μg/liter. The lethal threshold concentration (LTC) derived from acute exposures was 64 μg/liter, resulting in an application factor (MATC/LTC) between 0.26 and 0.62. LTC values for the bluegill and brook trout were 72 and 29 μg/liter, respectively. The estimated MATC is between 44.6 and 18.7 μg/liter for the blue gill and between 18.0 and 7.5 μ/liter for the brook trout. The half-life of captan in Lake Superior water with pH of 7.6 is about 7 hr at 12°C and about 1 hr at 25°C. Breakdown products from an initial 550 μg/liter of captan were not lethal to 3-month-old fathead minnows. (Author abstract by permission)

74-0909. Smith, R. M.; Cole, C. F. (Dept. Forestry and Wildl. Manage., Holdsworth Hall, Univ. Massachusetts, Amherst, MA 01002). **Effects of egg concentrations of DDT and dieldrin on development in winter flounder (*Pseudopleuronectes americanus*).** *J. Fish. Res. Bd. Can. 30(12): 1894-1898; 1973.* (7 references)

Abnormal gastrulation and a high incidence (mean = 39%) of vertebral deformities at hatching were encountered in developing eggs from winter flounder, *Pseudopleuronectes americanus*, experimentally exposed as adults to sublethal concentrations of DDT. Bone erosion and hemorrhaging at the vertebral junctures were often observed in conjuction with the vertebral deformities. No abnormal gastrulation and a lower incidence (mean < 1%) of vertebral deformities without bone erosion and hemorrhaging were encountered in controls. DDT concentrations in the eggs ranged from 0.39 to 4.60 (mean = 2.42 ppm) compared to 0.11-0.57 ppm (mean = 0.22 ppm) in the eggs from control flounder. No observable effect on development was noted in eggs from adults exposed experimentally only to dieldrin except in two lots of eggs most of which were dead and necrotic at spawning and contained 1.74 and 1.21 ppm dieldrin. No direct effect on fertilization mortality was due to gamete concentrations of DDT and dieldrin and no residues of either insecticide were detected in the milt from exposed or control male flounder. (Author abstract by permission)

74-0910. Majumdar, S. K.; Hall, R. C. (Lafayette College, Easton, PA 18042). **Cytogenetic effects of 2,4,5-T on in vivo bone marrow cells of Mongolian gerbils.** *J. Hered. 64(4): 213-216; 1973.* (20 references)

Chromosome gaps and breaks significantly increased when bone marrow cells of Mongolian gerbils were treated for 5 days with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin-free 2,4,5-T at doses of 250 mg/kg or more. Chromatid gaps, chromatid breaks, and fragments were increased 8.2, 4.6, and 1.8%, respectively, at the 350 mg/kg dose and 12.7, 7.1, and 1.7%, respectively, with the 500 mg/kg dose. A low mitotic index was observed at 500 mg/kg, possibly due to the toxic effects of 2,4,5-T on the bone marrow cells.

74-0911. Washino, R. K.; Ahmed, W.; Linn, J. D.; Whitesell, K. G. (Dept. Entomol., Univ. California, Davis, CA 95616). **Rice field mosquito control studies with low volume Dursban sprays in Colusa County, California IV. Effects upon aquatic nontarget organisms.** *Mosquito News 32(4): 531-537; 1972.* (9 references)

Of seven species tested in cages in fields treated 3 times with Dursban LV (chlorpyrifos), mayflies and dytiscid beetles were the only ones which exhibited higher than normal mortality. Of the caged fishes, bluegills had 32% mortality, but few mosquitofish died. No consistent pattern of mortality was observed when pre- and post-treatment dipping and light trapping were used to study acute affects of 2 Dursban applications on insect populations, and some populations were greater in treated than untreated fields. The fact that dytiscid beetles were shown to be affected, at least in cage studies, is of some concern since these are predators of mosquito larvae.

74-0912. Hyde, K. M.; Graves, J. B.; Watts, A. B.; Bonner, F. L. (Dept. Entomol., Louisiana State Univ., Baton Rouge, LA 70803). **Reproductive success of**

mallard ducks fed mirex. *J. Wildl. Manage. 37(4): 479-484; 1973.* (28 references)

Mirex (a polycyclic organochlorine) bait was incorporated in rations at 0, 1, and 100 ppm and fed to mallards (*Anas platyrhynchos*) for 25 weeks. Comparative measurements were obtained on egg production, shell thickness, shell weight, embryonation, hatchability, and duckling survival. Analysis of variance revealed nonsignificant differences ($P > 0.05$) among treatments for all parameters except duckling survival, which was reduced in the 100 ppm group to a highly significant ($P < 0.01$) degree. Percentage of ducklings surviving a 2-week post-hatch period was 72.6 in the 100 ppm treatment, compared to 93.8 and 95.7 for the 1 ppm and control groups, respectively. Results of gas-liquid chromatographic analyses revealed that mirex accumulated in eggs at levels approaching 2.8 times the level fed. The concentration factor of mirex in liver, wings, and fat ranged from 1.5 to 30 times the dietary level, whereas residues in brain and muscle were consistently below the amount administered. (Author abstract by permission)

74-0913. Todorov, D. (Bulgarian Acad. Sci., Inst. Nutrition, Sofia, Bulgaria). **Vliyaniye na diptereksa i metationa vurkhu vunshnoto dishane na plukhove (bezkontaktna pnevmografia). [Effects of dipterex and metathion on external breathing in rats (noncontact pneumography).]** *Khig. Zdraveopazvane 15(2): 189-195; 1972.* (12 references) (Bulgarian)

Noncontact pneumography is useful for investigating long-term changes in respiration of experimental animals during toxicologic experiments. The respiratory movements of the animals, positioned in enclosed chambers, are recorded electronically using a type of whole-body plethysmography, and are converted to minute volumes using a conversion formula. Animals were given 0.33, 0.2, or 0.1 LD50 of dipterex (trichlorfon) or metathion (fenitrothion); within 15 minutes after administration, the amplitude of recorded respiratory waves increased and the frequency of breathing was reduced. These values gradually returned to the initial level after 1-5 hr. At the 0.1 LD50 dose, the changes were slighter, but still manifest. (From author summary)

74-0914. Kruglov, Yu. V.; Gersh, N. B.; Bey-Biyenko, N. V. (All-Union Sci. Res. Inst. Agricult. Microbiol., USSR). **Vliyaniye meturina na biologicheskuyu aktivnost' pochvy. [Effects of meturin on biological activity of soil.]** *Khim. Sel. Khoz. 11(4): 294-296; 1973.* (6 references) (Russian)

The effects of 4 kg/ha doses of meturin were assessed on the biological activity of sandy soils with pH 5, and a total nitrogen content of 0.21-0.23%; and on that of loamy soils with pH 6.3 and a total nitrogen content of 0.24%. The numbers of fungi, heterotrophic bacteria, and acetobacter in both types of soil and of denitrifying and aerobic cellulolytic bacteria in loamy soils were reduced. The nitrifying bacteria count and the nitrifying capability of the soil did not change significantly. Invertase and protease activity was reduced and urease activity intensified; catalase activity did not change significantly. The results indicate that meturin is not toxic to soil microorganisms.

74-0915. Nenaydenko, G. M.; Baluyev, V. K.; Blinov, A. M.; Onokhin, B. N. (Ivanovo Inst. Agricult., Ivanovo, USSR). **Sovmestnoye primeneniye khlorkholinkhlorida i 2,4-D. [Joint application of chlorocholine chloride and 2,4-D.]** *Khim. Sel. Khoz. 11(5): 377-379; 1973.* (3 references) (Russian)

The joint effect of chlorocholine chloride and 2,4-D on the quality and quantity of wheat and rye crops and on the soil mesofauna was studied in laboratory and field tests. While 2,4-D alone caused considerable and prolonged reduction in the number of earthworms and other species of the *Carabidae* and *Staphilinidae*, it had no negative effect on such species when applied together with c lorocholine chloride in normal doses up to 4 kg/ha.

74-0916. Grant, W. F. (Genetics Lab., Macdonald Coll., St. Anne de Bellevue, Canada). **Pesticides and heredity.** *Macdonald J. 31(11):211-214; 1970.*

The genetic hazards of long term exposure to pesticides are only beginning to be realized since mutagenic and carcinogenic effects of these and other agents often require a long time period before manifestation. Since the discovery that nicotine sulfate caused partial sterility due to chromosome irregularities in tobacco, some chlorinated hydrocarbons, carbamates, organophosphates, phenoxy herbicides, and fungicides have been found to have various effects on chromosomes. Reduced fertility and increased resistance are results of the effects of organochlorines, while cancer and fetal abnormalities have been observed following administration of other pesticides.

74-0917. Muminov, A. I. (Tashkent Labor Red Banner Med. Inst., Dept. Histol. and Otorhinolaryngol., Tashkent, USSR). **Sostoyaniye spiral'nogo gangliya vnutrennego ukha pri khronicheskom otravlenii metilmerkaptofosom. [State of the spiral ganglion of the internal ear during chronic poisoning with methylmercaptophos.]** *Med. Zh. Uzb. 6: 56-57; 1973.* (Russian)

Methylmercaptophos was administered orally at 0.7 mg/kg doses to rabbits and albino rats for 180 days to study effects on the spiral ganglion of the internal ear. Circulatory disorders, edema of the intracellular connective tissue of the nerve cells, pericellular edema, dystrophic changes, peripheral and central tigrolysis in the cytoplasm, and corrugation of some cells were observed between the 150th and 180th days of the experiment. Considerable thickening of the nerve fibers,

vacuolization, and fragmentation of some nerve fibers were also observed. Pathologic changes of the spiral ganglion progressed with the advancement of the poisoning.

74-0918. Orzechowski, G. (5 Koeln 91, Wiehlerstr. 7, Germany). **Pestizide sind im Gespraech. [Pesticides under discussion.]** *Mitt. Deut. Pharm. Ges. 40(10): 249-260; 1970.* (52 references) (German)

Toxicologic aspects, symptomatology, and therapy for poisoning from various pesticides are reviewed. DDT, whose oral LD50 ranges from 200 to 500 mg/kg in different animals, causes liver damage, hepatic enzyme induction, serious neuromuscular disorders, paresthesia, tremor, ataxia, epileptiform-clonic-tonic spasms, trismus, opisthotonus, bradycardia or tachycardia, and gastroenteritis. Liver and kidney damage, possibly hemorrhages in the liver and kidney, and damage to the myocardium, intestines, adrenal glands, and lungs are caused by aldrin, dieldrin, endrin, chlordane, heptachlor, and toxaphene. Organophosphorus pesticides such as alkyl phosphates, and carbamates to a lesser degree, inhibit cholinesterase activity. Atropine and toxogonin are highly effective antagonists of organophosphorus pesticides. Alkylphosphates cause miosis, increased bronchial secretion, vomiting, diarrhea, lachrymation, bradycardia, asthenia, muscular fibrillation, coma, areflexia, Cheyne-Stokes respiration, and asphyxiation. Hyperthermia, cardiac disorders, and pulmonary edema may be caused by dinitro compounds. Cerebral edema, combined possibly with nervous and psychic abnormalities are indicative of mercury poisoning. Poisonings with thiram and thiocarbamate derivatives have nonspecific symptoms such as vomiting, diarrhea, and an odor of hydrogen sulfide.

74-0919. Poland, A.; Glover, E. (Dept. Pharmacol. Toxicol., Univ. Rochester School Med. Dentistry, Rochester, NY 14642). **Chlorinated dibenzo-*p*-dioxins: potent inducers of δ-aminolevulinic acid synthetase and aryl hydrocarbon hydroxylase. II. A study of the structure-activity relationship.** *Mol. Pharmacol. 9(6): 736-747; 1973.* (43 references)

TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin) produced a 2-fold induction of chick liver aryl hydrocarbon hydroxylase at 1.55 pmoles/egg and maximal induction at 155 pmoles/egg. Enzyme induction reached a maximum in 18 hr and persisted for at least 5 days and could be induced only by those congeners of dibenzo-*p*-dioxin with a minimum of 3 of the 4 lateral ring positions occupied by a halogen and with at least 1 nonhalogenated ring position. Pretreatment with inactive dioxins did not affect activity of the enzyme induced by TCDD. The same structure-activity relationship was obtained for induction of ALA synthetase in the chick embryo. Actinomycin D, administered just prior to TCDD treatment, blocked the induction of both enzymes. Only ALA synthetase induction was markedly sensitive to cycloheximide.

74-0920. Mohn, G. (Zentrallaboratorium Mutagenitaetspruefung DFG, Freiburg, Germany). **5-Methyltryptophan resistance mutations in *Escherichia coli* K-12.** *Mutat. Res. 20(1): 7-15; 1973.* (21 references)

During an investigation of the induction of 5-methyltryptophan (5-MT) resistance mutations in *E. coli* as a test system for mutagenic chemicals, dichlorvos, oxydemeton methyl, dimethoate, and bidrin (dicrotophos) were found to be active at concentrations of 3.3×10^{-4}, 1.0×10^{-3}, 1.0×10^{-3} and $2.0 \times 10^{-3} M$, respectively. The monofunctional alkylating agents, methyl methanesulfonate and *N*-methyl-*N'*-nitro-*N*-nitrosoguanidine, were active at lower concentrations. Methyl parathion was not significantly mutagenic at levels which did not inactivate the cells, but mutation frequency increased with concentrations causing decreased survival. In 300 min. incubations, parathion at $4.3 \times 10^{-2} M$, malathion at $2.0 \times 10^{-1} M$ and diazinon at $1.3 \times 10^{-2} M$ did not increase mutation frequency, even when 70% of the cells were inactivated.

74-0921. Kugelgen, V. von; Ohnesorge, F. K.* (Abt. fuer Toxikol., Inst. Pharmakol., Christian-Albrechts-Univ., 2300 Kiel, Germany). **Inhibition by DDT and related compounds of cardiac membraneous ATPase.** *Naunyn Schmiedeberg's Arch. Pharmacol. 277.(Suppl.): 40; 1973.*

The pH optimum of ATPase of calf-heart cell membranes ranged from 7.6 to 8.2. The substrate optimum was 1 m*M* (Mg^{++}-ATPase) and 2 m*M* (Na^+, K^+-ATPase). The activity increased nearly linear between 30 and 40°C (Q_{10} about 2). Different preparations differed slightly. Experimental conditions: 2 m*M* ATP, 37°C, pH 7.4. *p,p'*-DDT, *p,p'*-DDD (TDE), *p,p'*-DDE, and Kelthane (KEL) (dicofol) in concentrations ranging from 0.1 to 10μ*M* inhibited both the Mg^{++}- and the Na^+ K^+-ATPase. Inhibition of the Na^+, K^+- ATPase by the pesticides was more pronounced than the inhibition of the Mg^{++}-ATPase. The maximum degree of inhibition of the Na^+, K^+-ATPase was: 78% (KEL), 72% (DDD), 50% (DDT), and 51% (DDE); and of Mg^{++}-ATPase: 67% (KEL), 39% (DDD), 35% (DDT) and 23% (DDE). None of the compounds completely inhibited the ATPase. The ID50-values (concentration of inhibitor to produce half-maximal effect) ranged between 1 and 3 μ*M* for both ATPases. Combinations of DDT/DDE, DDD/DDE, KEL/DDE, and KEL/DDD in equimolar concentrations were less effective on both the Mg^{++}- and the Na^+, K^+-ATPase than the sum of the effects of each of the compounds on both ATPases. Only the combination KEL/DDD completely inhibited the Na^+, K^+-ATPase at a concentration of 10μ*M*. (Author abstract by permission)

74-0922. Portig, J.; Kraus, P.; Sodomann, S.; Noack, G. (Inst. Toxikol. Pharmakol., Philipps-Univ., D-3550 Marburg a.d. Lahn, Pilgrimstein 2, Germany). **Biodegradation of alpha-hexachlorocyclohexane. I. Glutathione-dependent conversion to a hydrophilic metabolite by rat liver cytosol.** *Naunyn-Schmiedeberg's Arch. Pharmacol. 279(2): 185-198; 1973.* (24 references)

Rat liver cytosol preparations incubated with labeled α-BHC at 10 μg/ml consistently rendered 5 to 10% of the radioactive material water soluble within 2 hr, regardless of label. Use of a more alkaline pH, longer time period, or cytosol from α-BHC-pretreated rats increased this conversion. GLC studies indicated that the solvent used to remove non-water soluble materials contained only α-BHC after the extraction. The reaction was apparently enzymic, dependent on GSH, involved dechlorination, and yielded a GSH conjugate with the BHC moiety rendered aromatic.

74-0923. Kraus, P.; Noack, G.; Portig, J. (Inst. Toxikol. Pharmakol., Philipps-Univ., D-3550 Marburg a.d. Lahn, Pilgrimstein 2, Germany). **Biodegradation of alpha-hexachlorocyclohexane. II. Glutathione-mediated conversion to hydrophilic substance by particulate fractions of rat liver and by homogenates of various rat organs.** *Naunyn-Schmiedeberg's Arch. Pharmacol. 279(2): 199-202; 1973.* (2 references)

GSH-mediated formation of hydrophilic radioactive substance from ^{14}C-alpha-BHC was observed in the three particulate fractions from rat liver. Activity per mg of protein was on the same order of magnitude for mitochondria, microsomes, cytosol, and also nuclei. In terms of percent of BHC transformed, activity was greater in the cytosol. Pretreatment of the animals with BHC, which has been reported to stimulate activity in the cytosol, did not increase conversion in the other three fractions. The products formed by the cytosol and the other fractions were similar, but not necessarily identical. Hydrophilic product formation from BHC was also observed in kidneys, spleen, lungs, and brain, suggesting that the system is one which normally deals with endogenous substrates.

74-0924. Minck, K.; Schupp, R. R.; Illing, H. P. A.; Kahl, G. F.; Netter, K. J. (Pharmakol. Inst. der Univ. Mainz, Mainz, Germany). **Interrelationship between demethylation of *p*-nitroanisole and conjugation of *p*-nitrophenol in rat liver.** *Naunyn-Schmiedeberg's Arch. Pharmacol. 279(4): 347-360; 1973.* (32 references)

The metabolism of *p*-nitroanisole (pNA) and *p*-nitrophenol (pNP) was studied in isolated rat livers perfused with a hemoglobin-free medium. The activity and viability of the surviving organ was tested by recording pH, "arterial" and "venous" oxygen tension as well as the disappearance of added pNP. pNA is converted to its primary metabolite pNP which, in turn, is excreted into the perfusion medium as conjugates. The coordination of pNA oxidation and the conjugation reactions of pNP were investigated. When 50 μM pNA is added as substrate 0.4 ± 0.1 nmoles × $m\Gamma^{-1}$ × $(g\ liver)^{-1}$ are excreted as pNP-glucuronide and 3.5 ± 0.2 nmoles × $m\Gamma^{-1}$ × $(g\ liver)^{-1}$ as the sulfate within 90 min. When pNP itself (50 μM) is the substrate there is a large increase in the glucuronide/sulfate ratio after 50 min to 2.1 ± 0.2 nmoles × $m\Gamma^{-1}$ × $(g\ liver)^{-1}$ pNP-glucuronide and 2.5 ± 0.3 nmoles × $m\Gamma^{-1}$ × $(g\ liver)^{-1}$ sulfate. It is concluded that the concentration of pNP in the liver cell determines the type of conjugate discharged. If the pNP concentration is high as in perfusion with pNP itself there is roughly equal formation of glucuronide and sulfate. If pNP concentration is low as in perfusion with its precursor pNA, sulfation prevails very markedly. A possible enzymatic explanation for this finding is discussed. Small, but detectable, quantities of pNP glucoside were found in the medium after perfusion with either pNA or pNP. (Author abstract by permission)

74-0925. Noack, G.; Portig, J. (Inst. fuer Toxikol. und Pharmakol. der Philipps-Univ., Marburg, Germany). **Biodegradation of alpha-hexachlorocyclohexane. III. Decrease in liver non-protein thiol after intragastric application of the drug.** *Naunyn-Schmiedeberg's Arch. Pharmacol. 280(2): 183-189; 1973.* (12 references)

Alpha-hexachlorocyclohexane (alpha-BHC) reduces total non-protein thiol in the liver of the rat through a reduction in glutathione (GSH) content. Brain and kidney non-protein thiol is not affected. Maximum reduction was by about 50% 18 hr after 400 mg/kg, the highest dose tested. At this time, the decrease in liver non-protein thiol was linearly related to dose and to alpha-BHC concentration in liver as a whole and in the liver cytosol fraction. The effect is thought to be causally related to GSH-dependent degradation of alpha-BHC in the liver, previously shown to take place in vitro. (Author abstract by permission)

74-0926. Luellmann, H.; Preuner, J. (Inst. Pharmakol., Univ. Kiel, Germany). **Effect of diisopropylfluorophosphate, edrophonium and a stabilizing agent on the conformation of acetylcholinesterase.** *Naunyn-Schmiedeberg's Arch. Pharmacol. 280(4): 339-351; 1973.* (38 references)

The far-ultraviolet circular dichroism spectrum of acetylcholinesterase (E.C. 3.1.1.7) contained three extrema at 220, 208, and near 192 nm. The position of the ellipticity bands resembled those reported for α-helical poly-L-glutamic acid. In the absence of a stabilizing substituent both the CD-spectrum and the enzymatic activity were unstable. Within a few hours, both the amplitude of all three ellipticity bands and the enzymatic activity declined. However, the presence of human serum albumin completely prevented the loss of activity and the spectral changes. The CD spectra of the

stabilized AChE displayed two parameters which can be influenced independent from each other: the magnitude of the ellipticity bands and the accentuation of the bands at 220 and 208 nm. The magnitude of the bands, particularly the one at 208 nm, indicates the degree of ordered structure: polymerization of the AChE at low ionic strength increased the magnitude, but was accompanied by a reduction of enzymatic activity. An immediate correlation between α-helix content and enzymatic activity seems highly improbable. The degree of accentuation, however, was correlated with the enzymatic activity: depolymerization of the AChE enhanced both parameters, whereas the inhibitors DFP and edrophonium depressed both. In addition, DFP reduced the α-helix content. This was independent of the conditions under which inhibition was produced and always attained the same degree. (Author abstract by permission)

74-0927. Ruedel, R.; Senges, J. (Physiol. Inst. Tech. Univ., Ismaninger Strasse 19, D-8 Munich 80, Germany). **Experimental myotonia.** *IN: New Developments in Electromyography and Clinical Neurophysiology. J. E. Desmedt, ed., Karger, Basel, 1973, vol. 1, pp. 483-491.* (14 references)

Experimental myotonia was produced by 2.5 m*M* 2,4-D in rat diaphragm bathed in Ca-deficient medium. Within 14 min, practically all fibers were myotonic. Prolongation of a contraction, elicited by a single stimuli of 0.5 msec duration, began almost at the peak of contraction. At the same time, trains of activity were recorded in the EMG. Fully developed myotonia persisted for 5 to 10 min, and then amplitude and duration of contraction fell to zero due to some toxic action of the herbicide. The main change in membrane parameters induced by 2,4-D was an increase in the specific membrane resistance by about a factor of 2.5. Myotonia produced by complete omission of extracellular chloride was reduced by addition of the alkaloid sparteine, an antifibrillatory agent, at 10^{-4} g/ml, but the drug was not tried with 2,4-D-induced myotonia.

74-0928. Ooka, R.; Komoto, M.; Morikawa, S.; Kikuchi, N.; Arimoto, H.; Gekka, M.; Fukami, Y.; Tanahashi, Y.; Ito, K. (Sch. Ophthalmol., Fac. Med., Toho Univ., Tokyo, Japan). **[Eye disorders in rats experimentally poisoned with organophosphorus compounds.]** *Nippon Ganka Gakkai Zasshi (J. Jap. Ophthalmol. Soc.) 77(9): 1226-1236; 1973.* (9 references) (Japanese)

Four groups of 20 young female Donryu rats each were fed diets containing 600, 300, 150, or 100 ppm of fenitrothion. Before and 2, 4, 6, and 8 weeks after the beginning of feeding, the ocular and general symptoms, body weights, feed intakes, and blood ChE activity were examined. At the end of the experimental period, blood was collected for hematologic and liver function tests; the eyeballs and several other organs were removed for histologic and electron microscopic examination. The groups given 600 and 300 ppm showed severe ocular abnormalities such as turbidity, protuberance, and projection of the cornea, resulting in scarring and phthisis bulbi. The groups given lower doses showed no apparent changes. Examination of the sugar metabolism in the eye using ^{14}C-glucose showed accelerated activities in the HMP system and the EMP-TCA system in the groups given 600 and 300 ppm. Although marked inflammatory changes were seen in all corneal layers by histological and electron-microscopic examination, no significant change was observed in the retina or in the optic nerve even in the group given the highest dose.

74-0929. Tokoro, T.; Suzuki, K.; Nakano, H.; Otsuka, J.; Suzuki, H. (School of Ophthalmol., Tokyo Medical and Dental Univ., Tokyo, Japan). **[On the long-term observations on the refraction and the intraocular pressure of dogs experimentally and chronically intoxicated by organophosphorus insecticide.]** *Nippon Ganka Gakkai Zasshi (J. Jap. Opthalmol. Soc.) 77(9): 1237-1245; 1973.* (29 references) (Japanese)

Capsules containing ethylthiometon (disulfoton) were administered p.o. to 4 beagles at 5 and 10 mg/dog/day and to one dog at 15 mg/dog/day for two years. Six dogs given empty capsules were used as controls. Four months, one, and two years after the beginning of the experiment, the degree of refraction and astigmatism, the ocular refractive components, and the change of ocular pressure were examined along with the correlation to erythrocyte ChE activity. A myopic tendency was clearly recognized after two years of administration of ethylthiometon, compared to controls. Direct astigmatism was seen after four months' dosing and seemed to be of corneal origin. However, the findings after one year suggested an astigmatic change of the lens. A correlation was seen between the degree of refraction and erythrocyte ChE activity at every examination. The progress of myopia was faster in animals whose erythrocyte ChE activity was lower. It was noticed that the lower the activity of erythrocyte ChE, the longer the length of ocular axis between four months and one year of dosing. Ocular pressure increased a little after one year's dosing and decreased a little after two year's dosing as compared to controls; the same findings were obtained during mydriatic tests. These findings resembled findings on the degree of refraction and astigmatism and the ocular pressure observed in children in Saku and Moriguchi districts.

74-0930. Mukuno, K.; Imai, H. (Sch. Ophthalmol., Fac. of Med., Kitasato Univ., Sagamihara, Japan). **[A study on extraocular muscles of beagles intoxicated chronically by an organophosphorus compound— histochemical and electron microscopic observation.]** *Nippon Ganka Gakkai Zasshi (J. Jap. Ophthalol. Soc.) 77(9): 1246-1253; 1973.* (17 references) (Japanese)

An organophosphorus insecticide, ethylthiometon (disulfoton), was administered at about 0.5 to 1.5 mg/kg/day to a small group of beagles. The dogs were sacrificed after two years and the pathohistological changes in several organs examined. Other findings will be reported elsewhere; in this paper, only the morphologic changes in the extraocular muscles were reported, these muscles having the highest ChE activity in the body. Swelling of the medullary sheath was followed by demyelination of medullary nerve fibers in the intramuscular nerve fiber bundle. Atrophic changes at junctional folds included enlargement, irregular direction, decreasing number, and shortening. Selective swelling of mitochondria in muscular fibers and appearance of giant mitochondria and irregular sized mitochondria were never seen in controls and were ascribed to the changes produced by the organophosphorus insecticide. These changes in the extraocular muscles probably constitute a neuromyopathy, suggesting the consideration of chronic organophosphorus intoxication as one of the causes of chronic progressive paralysis of extraocular muscles in man.

74-0931. Hikita, H.; Miyata, M.; Ishikawa, S. (School of Ophthalmol., Fac. of Med., Kitasato Univ., Sagamihara, Japan). **[A biochemical study on acetylcholinesterase in dogs experimentally and chronically intoxicated by an organophosphorus insecticide.]** *Nippon Gankka Gakkai Zasshi (J. Jap. Ophthalmol. Soc.) 77(9): 1254-1265; 1973.* (21 references) (Japanese)

Capsules containing ethylthiometon (disulfoton) were orally administered to beagles once a day, five days a week, for two years at a daily dose of about 0.5, 1.0, and 1.5 mg/kg. Long term administration of ethylthiometon caused a dose-response decrease of whole body ChE activity; however, serum pseudo- ChE activity showed no decrease. In healthy dogs true AChE activity was high in extraocular muscles, retina, uvea, brain, spinal cord, and digestive tract; pseudo-ChE activity was high in liver, pancreas, extraocular muscles, and digestive tract. Administered ethylthiometon remained in all organs examined during the administration, its concentration being especially high in the kidney, serum, liver, and CNS. The dogs' urine and bile contained large amounts of ethylthiometon and its metabolites. The parts where the ChE activity decreased and large amounts of ethylthiometon remained coincided with the parts where the clinical symptoms of organophosphorus intoxication frequently appear.

74-0932. Bell, J. (Wallaceville Anim. Res. Cent., Dept. Agr., Wellington, New Zealand). **The acute toxicity of four common poisons to the opossum, *Trichosurus vulpecula*.** *N. Z. Vet. J. 20(11): 212-214; 1972.* (8 references)

Wild opossums were given oral doses of sodium monofluoroacetate, sodium cyanide, strychnine alkaloid, or arsenic trioxide. The median lethal dose expressed in mg/kg body weight was 0.79 for sodium monofluoroacetate, 8.22 for arsenic trioxide, 8.86 for sodium cyanide, and 22.36 for strychnine. Sodium monofluoroacetate and sodium cyanide are considered preferable to arsenic trioxide and strychnine alkaloid for the control of wild opossums. However, sodium monofluoroacetate in carcasses creates a secondary poisoning hazard to which carnivores, especially dogs, are extremely susceptible; sodium cyanide also has a major drawback in that survivors of a sublethal dose recognize subsequent exposure and become poison shy.

74-0933. Bourke, T. V.; Morrison, W. B.; Macartney, B. K. (Dept. Agr., Stock Fish., Popondetta, New Guinea). **Effect of prolonged spraying with trichlorphon on blood cholinesterase levels of sprayers.** *Papua New Guinea Agr. J. 22(3): 151-164; 1971.* (21 references)

In one series of controlled trials blood ChE activity of sprayers applying trichlorphon (trichlorfon) to a block of cacao at a rate of 1.5 lb/A decreased steadily 12% every two days for the first two weeks and then leveled off for six weeks. The level dropped sharply to 40 or 50 units by nine and a half weeks and, although this was well above the 25 to 30% of normal activity at which symptoms develop, sprayers were removed from exposure. During application of trichlorphon at 2 lb/A in LVC a steady decrease in ChE activity of about 16%/wk was observed over the first two weeks. Protective clothing did not prevent this decrease. For the remaining seven weeks levels in unprotected sprayers were 32 to 48% below normal, while protected sprayers had levels 33% below normal. No difference was observed between ChE activities of Europeans and Papua New Guineans. A field test kit for analysis of ChE levels was abandoned because of irreproducible results.

74-0934. Reznikov, A. G.; Kravtsova, Ye. L. (Kiev Sci. Res. Inst. Endocrinol. Metab., Lab. Pathol. Physiol., Kiev, USSR). **Deystviye *o,p'*-DDD na sekretsiyu 11- i 17-OKS u sobak vo vremya stressa. [Effect of *o,p'*-DDD on the secretion of 11- and 17-hydroxycorticosteroids in dogs during stress.]** *Patol. Fiziol. Eksp. Ter. 14: 38-40; 1970.* (18 references) (Russian)

The rate of 17- and 11-hydroxycorticosteroid secretion was studied by column chromatography in dogs stressed by anesthesia and surgery after treatment with 25 mg/kg of *o,p'*-DDD (TDE) daily for 7 days. The 17-hydroxycorticosteroid, 11-hydroxycorticosteroid, hydrocortisone, and corticosterone levels in plasma from adrenal vein blood were 7.85±2.76, 8.52±2.97, 5.06±2.90, and 0.94±0.50 μg % compared to control levels of 400.2±86.9, 632.3±131.9, 300.2±59.2, and 132.7±27 μg %. The rates of secretion of 17-hydroxycorticosteroid, 11-hydroxycorticosteroid, hydrocortisone, and corticosterone were thus calculated as 0.23±0.08, 0.22±0.06, 0.12±0.07, and 0.02±0.01

μg/g/min in the test group, and 8.23± 1.50, 13.20± 2.72, 6.78± 0.81, and 2.96± 0.21 μg/g/min in the control group. Hydrocortisone and corticosterone biosynthesis were inhibited equally by *o,p'*-DDD.

74-0935. Klee, G. E.; Butcher, J. W.; Zabik, M. (Coll. Natural Sci., Michigan State Univ., E. Lansing, MI 48823). **DDT movement and metabolism in forest litter microarthropods.** *Pedobiologia 13(3): 169-185; 1973.* (77 references)

The two major isomers of DDT, introduced into the food chain via resistant Collembola fed the pesticides for two days, were metabolized by almost all the micro- and macroarthropod forest litter taxa investigated. The release was comparable to an applicaton rate of 4 to 7 g/A and the method provided sufficient material for analysis without major disturbance of the forest floor environment. Complete metabolism of *p,p'*-DDT to *p,p'*-DDE and *p,p'*-DDD (TDE) occurred within two weeks in most organisms, and high concentrations of DDD and DDE were found in Collembola on the first days after introduction. DDT and DDD disappeared at the same time. The conversion of *o,p'*-DDT was slower, and *p,p'*-DDE was the final product. After introduction of *p,p'*-DDE, there was a gradual drop with time in all animals in which DDE was detected.

74-0936. Smalley, H. E. (Vet. Toxicol. Entomol. Res. Lab., Agr. Res. Sta., U.S.D.A., College Station, TX 77840). **Toxicity and hazard of the herbicide, paraquat, in turkeys.** *Poultry Sci. 52(4): 1625-1628; 1973.* (7 references)

The toxicity of the herbicide, paraquat, in turkeys varied according to administration route. The lethal dose was about 100 mg/kg by intraperitoneal injection, 20 mg/kg by intravenous injection, 290 mg/kg by oral administration, and 500 mg/kg by dermal application. Signs of oral paraquat poisoning include a fetid diarrhea, ruffled feathers, dullness or listlessness, and anorexia. Short, terminal convulsions were seen in birds dosed orally. Necropsy lesions were primarily those of extensive gastroenteritis in birds dosed orally; lesions of dermal poisoning were emaciation and blistering and cracking of skin with exudate matting the feathers. Turkeys kept in small range plots for 30 days, beginning 24 hours after the plots were sprayed with paraquat at the recommended rate (2 oz cation/acre), had no signs of toxicity. (Author abstract by permission)

74-0937. Petit, L.; Leperchey, F.; Fournier, E. (Hopital Fernand-Widal, Clin. Toxicol., Paris 10, France). **Toxicologie experimentale des isothiourees. [Experimental toxicology of the isothioureas.]** *Poumon Coeur 26(8): 893-894; 1970.* (French).

The acute toxicity of *α*-naphthylthiourea (ANTU), commonly used as a rat killer, was studied. Rats administered a single dose of 50 mg of naphthylthiourea either survived without displaying any symptoms of poisoning or died from highly acute pulmonary edema within a few minutes. The acute oral toxicity of naphthylthiourea ranged from 5 mg/kg to 400 mg/kg in various animal species. The great discrepancy in the toxicity of naphthylthiourea seems to be conditioned by the metabolic fate of this substance in the animal and most probably by the eventual liberation of hydrogen sulfide in the course of enzymatic desulfurization.

74-0938. Astolfi, E.; Donnewald, H.; Monserrat, J.; Calabrese, A. (Univ. Buenos Aires, Fac. Med., Buenos Aires, Argentina). **Le poumon dans l'intoxication par les pesticides organophosphores. [The lung in organophosphorus pesticide poisoning.]** *Poumon Coeur 26(9): 1067-1073; 1970.*

Light microscopic and electron microscopic studies were performed on the lungs of Wistar rats killed by s.c. injection of dichlorvos at 60 mg/kg. Light microscopic investigations of the bronchioles revealed epithelial lesions ranging from isolated desquamation of cells to total desquamation of large fragments of the mucosa with intrabronchiolar hemorrhages, hyperplasia, and hypersecretion of secretory cells. Heterogeneous matter composed of mucous or fibrinous fragments and blood was found inside the bronchioles. Desquamated matter and bronchiolar secretions, further aggravating obstruction, were found in the stem bronchi. Examination of the pulmonary parenchyma revealed no clinically significant signs of edema, but a few microscopic foci of subpleural edema without clinical significance were detected. Large zones of pulmonary atelectasis surrounded by zones of vicarious emphysema were evident. Electron microscopic examinations fully supporting the light microscopic findings revealed no abnormalities in the alveolar walls, the capillary walls, the cytoplasmic organelles, or the nuclei.

74-0939. Ulrich, K. (Author address not given). **Akute Vergiftungen beim kleinen Haustier. [Acute poisonings in small domestic animals.]** *Prakt. Tierarzt 51(13): 620-623; 1970.* (German)

Symptoms and therapy of acute poisonings with dicumarol, metaldehyde, Mexaform S (antidiarrheal), and zinc phosphide in domestic animals are described. Dicumarol, used as a rodenticide, has a relatively low toxicity for fowl and ruminants, while carnivores and swine are highly sensitive. Large individual variations in toxicity were observed. Whereas dicumarol was nearly ineffective in some dogs when administered at 50 mg/kg, other dogs died from a dose of 1 mg/kg. Anemia, depression, epistaxis, bloody vomiting and diarrhea, intramuscular and subcutaneous hematomas, and cerebral hemorrhage are the principal symptoms of acute poisonings with dicumarol. Metaldehyde, with a lethal dose in dogs of 0.25 to 0.5 g/kg, causes convulsions,

muscular tremor, hypersalivation, hyperesthesia, dyspnea, gastrointestinal symptoms, and clonic-tonic spasms. Horizontal nystagmus was observed in cats. Motor excitation followed by prolonged sleep is the main symptom of zinc phosphide poisoning.

74-0940. Mitchell, L. (Blair Res. Lab., Salisbury, Rhodesia). **Testing a new molluscicide.** *Rhodesia Sci. News 6(11): 318-321; 1972.*

In a trial of triphenyl lead acetate as a molluscicide, the changes in numbers of several zooplankters after treatment of ponds at molluscicidal levels (0.25 ppm) were examined. Total fauna in four liters of pond water were counted by filtering the water through a fine plankton net and examining the organisms collected under a dissecting microscope. A noticeable decrease in total and individual species counts occurred immediately after application of the molluscicide to the test pond, but since a similar decrease occurred in the untreated pond, the drop was attributed to extraneous factors. Changes in numbers of Cladocera and Copepoda in the experimental pond paralleled those in the control pond.

74-0941. Sova, Z.; Pujman, V.; Janda, J.; Koudela, K.; Vrbenska, A.; Houska, J.; Trefny, D.; Krepelka, V.; Nemec, Z.; Mostkova, I.; Boseova, M.; Breyl, J. (Katedra Fyziologie Hospodarskych Zvirat Vysoka Skola Zemedelska, Praha-Suchdol, Czechoslovakia). **The effect of DDT on pheasants.** *Sci. Agr. Bohemoslov. 3(1): 79-89; 1971.* (19 references)

Pheasants fed a diet containing 0.02% DDT (0.04% Dykol) for 14 days exhibited no clinical signs of DDT intoxication, no change in food consumption or weight gain, and no significant changes in serum GOT, GPT, alkaline phosphatase, or protein. Uricemia was observed in treated birds at both 1 and 14 days after discontinuation of DDT adminstration. Dry weight, protein, and mineral content of livers were not significantly different, but a marked reduction was observed in nonprotein nitrogen and urea in the liver at the end of treatment. Experimental birds had lower liver lipid levels 16 days after treatment. Slightly higher, but not significantly different, activities of GOT, GPT, and amylase were found in livers of experimental birds after discontinuation of treatment.

74-0942. Janda, J. (Res. Inst. of Forestry and Game Manage., Zbraslav/Vltava-Havlin, Czechoslovakia). **The toxicity of Zn_3P_2 to pheasants and partridges and its decomposition under natural conditions.** *Sci. Agr. Bohemoslov. 4(21): 307-316; 1972.* (9 references)

Three rodenticide preparations containing Zn_3P_2 were applied to the craw of pheasants and partridges to determine relative toxicities. The LD50 of Nera-grains was found to be the same, 1067 mg/kg, for both species. M-Koeder klein had an LD50 of 549 mg/kg for pheasants and 746 mg/kg for partridges. Respective values of 241 mg/kg and 263 mg/kg were obtained with Arrex E. In all cases only a small amount of the preparation has to be consumed by the bird for a fatal outcome. The most frequently observed sign of intoxication was languor, accompanied by decreased food consumption, followed by body rigor. Death occurred 12 to 24 hr after dosing. Post-mortem examination revealed changes in liver, kidney, lungs, heart, spleen, and intestinal mucous membrane. Results of a study of the degradation of the active ingredient in the three preparations under climatic conditions indicated a very slow breakdown. M-Koeder klein showed the fastest rate of breakdown (39% in 21 days) although conditions were not uniform for the three preparations.

74-0943. Uchiyama, M.; Yoshida, T.; Homma, K. (Fac. of Pharmacy, Tohoku Univ., Sendai, Japan). **[Persistence of organophosphorus insecticides in animals and changes in detoxifying activity.]** *Seikagaku (J. Jap. Biochem. Soc.) 45(8): 551; 1973.* (Japanese)

In addition to the specific inhibition of ChE, organophosphorus insecticides have many other effects on living organisms. In spite of the well known tendency of organophosphates to be metabolized far more readily than organochlorine insecticides and to be excreted quickly from mammals, some indications of persistence of orally administered fenitrothion in mice have been found. The half-life of fenitrothion was noticeably longer after 10-day p.o. administration at 30 mg/kg/day than after a single p.o. dose of 300 mg/kg. Degradation of fenitrothion in the mouse liver was suppressed during chronic administration. Fenitrothion appreciably inhibited microsomal demethylation and hydrolysis activity.

74-0944. Ohi, G. (Tokyo Metropolitan Lab. of Public Health, Tokyo, Japan). **[Selected aspects of biological effects of PCBs.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Japan) 13(6): 499-508; 1972.* (45 references) (Japanese)

Experiments on synergistic effects of polychlorinated biphenyls in the presence of chlorinated hydrocarbon pesticides are reviewed. Increases in the toxicity of PCBs in the presence of BHC, DDT, DDE, dieldrin, aldrin, paraoxon, and parathion have been reported by various scientists as a result of experiments performed on houseflies, pheasants, migratory birds, and dogs. Although the exact mechanism is not known, it has been noted repeatedly that PCB residues have a tendency to concentrate in the brain in the presence of DDT and DDE. In such cases, the total residue of PCB in the body

has also been reported to increase. A case of an eagle with 100 ppm of PCBs in the brain has been reported; the presence of DDT and its metabolites in the body was assumed to be responsible for this high concentration.

74-0945. Younger, R. L. (Agr. Res. Serv., Vet. Sci. Res. Div., Toxicol. Res. Lab., Kerrville, TX 78028). **Effects of three aziridine alkylating compounds on the gross development of chicken embryos.** *Toxicol. Appl. Pharmacol. 24(3): 423-433; 1973.* (36 references)

The effects of apholate, metepa, and tepa on developing chicken embryos were studied after yolk sac injection of saline solutions of these compounds at various dosages. Without regard to day of injection or dose (days 1-4 of incubation), apholate-injected eggs had the highest incidence of cumulative mortality and the lowest mean body weight of day 18 viable embryos, followed by the tepa-injected group, then the metepa-injected group. Cumulative mortality differed significantly between compound-treated groups and controls ($p<0.005$), between apholate and metepa groups ($p<0.005$), between tepa and metepa groups ($p<0.005$), but not between apholate and tepa groups. Using mortality as an index of toxicity, LD50 values obtained for these compounds in day 4 or day 10 embryos proved apholate to be the most toxic, followed by tepa, then metepa. Significant differences in mean body weights for viable day 18 embryos existed between compound-treated groups and controls ($p<0.005$), between apholate and metepa groups ($p<0.005$), between tepa and metepa groups ($p<0.005$), but not between apholate and tepa groups. The incidence of defective embryos, combined on day 18, differed significantly between compound-treated groups and controls ($p<0.005$). Within compound-injected groups, significant differences in the combined incidence of defective nonviable and viable embryos existed between apholate and tepa groups ($p<0.05$), between metepa and tepa groups ($p<0.05$), but not between apholate and metepa groups. For day 18 viable embryos, the incidence of defective embryos differed significantly between apholate and metepa groups ($p<0.025$), between metepa and tepa groups ($p<0.005$), but not between apholate and tepa groups. The 62.5 μg/egg dose of metepa or tepa had greater teratogenic activity on embryos as evidenced by the incidence of defective embryos produced. All doses of apholate except the 250 μg/egg dose produced about the same incidence of defective embryos. Each aziridine compound induced one or more malformations in chicken embryos that were basically similar and increased the incidence of certain spontaneous defects. Deformities common to compound-treated groups were beak, cranial, ocular, leg, and digit defects. Defects common to both compound-treated and control groups were ectopic viscera, deformed digits, and general edema. This study demonstrates a significant teratogenic effect on chicken embryos by each aziridine compound. (Author abstract by permission)

74-0946. Isom, G.; Way, J. L. (Dept. Pharmacol., Washington State Univ. Coll. Vet. Med., Pullman, WA 99163). **Cyanide intoxication: protection with cobaltous chloride.** *Toxicol. Appl. Pharmacol. 24(3): 449-456; 1973.* (25 references)

Protection against the lethal effects of cyanide can be elicited by administration of cobaltous chloride, either alone or in combination with sodium nitrite and/or sodium thiosulfate. Potency ratios derived from the LD50 values were compared in groups of mice premedicated with cobaltous chloride and/or sodium thiosulfate and/or sodium nitrite. Under the conditions of our experiment cobaltous chloride alone is slightly more effective than sodium nitrite; when it is combined with sodium nitrite, an additive effect is obtained. When cobaltous chloride is administered in combination with sodium thiosulfate, a dramatic antagonism of the lethal effects of potassium cyanide is observed. The synergistic antidotal effect of cobaltous chloride may be related to the physiological disposition of the cobaltous ion and its ability to chelate both cyanide and thiocyanate ions. (Author abstract by permission)

74-0947. Goldstein, J. A.; Hickman, P.; Kimbrough, R. D. (Environ. Protect Agency, Bio-Effects Branch, Chamblee, GA 30341). **Effects of purified and technical piperonyl butoxide on drug-metabolizing enzymes and ultrastructure of rat liver.** *Toxicol. Appl. Pharmacol. 26(3): 444-458; 1973.* (31 references)

Weanling male rats were fed technical grade piperonyl butoxide at dietary levels of 1000, 5000 and 10,000 ppm for 1, 4 and 8 weeks and 100 ppm for 1 week. Activities of hexobarbital oxidase, aniline hydroxylase, *p*-nitroanisole-demethylase, nitroreductase, glucuronyltransferase and P-450 content were increased 2- to 4-fold by 5000 or 10,000 ppm technical grade piperonyl butoxide. Liver weight and microsomal protein were increased a maximum of 50-70% by piperonyl butoxide. Electon microscopy showed enlargement and extensive proliferation of the smooth endoplasmic reticulum (SER) in liver parenchymal cells of rats fed 5000 or 10,000 ppm technical grade piperonyl butoxide. A dose of 1000 ppm produced minimal effects on liver weight, P-450, and glucuronyltransferase activity, but no effects of this dose could be detected on proliferation of the SER. Maximum induction of P-450 and the drug-metabolizing enzymes which require P-450 occurred after 1 week of exposure with all doses of piperonyl butoxide. In contrast, the effects of 10,000 ppm piperonyl-butoxide on liver weight, cellular hypertrophy and SER prolifleration appeared greater after 8 weeks than after 1 week. No differences in the degree of SER proliferation could be detected after different lengths of exposure to 5000 ppm piperonyl butoxide. Glucuronyl transferase activity was induced maximally between 4 and 8 weeks at all dose levels. Purified and technical grade piperonyl butoxide (10,000 ppm) were equally effective in increasing liver drug-

metabolizing enzymes and producing proliferation of the SER. (Author abstract by permission)

74-0948. Greichus, Y. A.; Hannon, M. R. (Exp. Sta. Biochem. Dept., S. Dakota State Univ., Brookings, SD 57006). **Distribution and biochemical effects of DDT, DDD and DDE in penned double-crested cormorants.** *Toxicol. Appl. Pharmacol. 26(4): 483-494; 1973.* (28 references)

Concentrations, distribution and chronic effects of DDT, DDD (TDE), and DDE were determined in penned cormorants (*Phalacrocorax a. auritus*) treated with 2, 5 and 10 mg of a combination of these compounds daily in their diet. Birds stressed by a one-half decrease in food after the cessation of 9 weeks of treatment and birds that died of DDT toxicity showed a marked increase in brain and liver residues and a decrease in carcass residues. Higher brain residue levels were significantly correlated with decreased body weight ($p<0.01$) and carcass lipid content ($p<0.05$). DDD concentrations in the brain were found to be the best indicator of DDT toxicity. Brain concentrations ranged from 24 to 85 ppm in birds that died of toxic effects and from 0.4 to 29 ppm in survivors, indicating that 30 ppm was diagnostic of toxicity. Brain concentrations of DDT and metabolites in wild cormorants indicated no immediate danger of toxicity. Average residue levels in the carcass of wild adult cormorants was 1.00 ppm for DDD and 10.6 ppm for the total of DDT, DDD, and DDE. This represents a total body burden of 2.2 mg of DDD and 23.3 mg of the DDT complex as adult cormorants averaged 2200 g in body weight. Analysis of total liver vitamin A indicated a significant decrease of vitamin A due to treatment. An analysis of variance showed a significant decrease in liver ($p< 0.05$) and heart weights ($p<0.05$) due to treatment but not brain or spleen weights when analyzed as percentage of body weight. A significant negative correlation was found between liver weight and brain concentrations of DDE + DDD + DDT ($p<0.05$). No significant effects due to treatment were found on blood chemistry values. (Author abstract by permission)

74-0949. Chen, T. S.; DuBois, K. P. (Dept. Pharmacol., Univ. Louisville, Louisville, KY). **Studies on the enzyme inducing effect of polychlorinated biphenyls.** *Toxicol. Appl. Pharmacol. 26(4): 504-512; 1973.* (14 references)

Aroclor 1260 was fed to weanling male and female rats in the diet at levels of 1, 5, 25, and 50 ppm to determine its enzyme inducing capacity over various feeding periods. Dose-dependent increases in the activity of 3 hepatic microsomal enzymes were observed; maximal induction occurred in the first 3 weeks of the feeding period. Among the 3 enzyme systems studied, *N*-demethylase was the most sensitive to the inducing effect of Aroclor 1260. The enzyme induction was more pronounced in male rats than in females. An age difference in susceptibility of male rats to the enzyme inducing effect was also noted, young rats being more susceptible than adults. Data obtained by simultaneously feeding PCB and DDT to rats showed that these compounds have additive inducing effects on *N*-demethylase activity. However, PCB and DDT were not, when combined, additive on the *O*-demethylase and EPN detoxification systems under the test conditions employed. Comparison of enzyme inducing effects of three Aroclor compounds, Aroclor 1221, 1254, and 1260, clearly indicates that both microsomal *N*-demethylase and EPN detoxification activity were increased in proportion to the chlorine content of the Aroclor compounds. Maximal induction of *O*-demethylase occurred at 54% chlorination. (Author abstract by permission)

74-0950. Thomas, J. A.; Lloyd, J. W.; Smith, M. T.; Mawhinney, M. G.; Smith, C. G. (Dept. Pharmacol., W. Virginia Univ. Med. Cent., Morgantown, WV 26506). **Effect of dieldrin on the accumulation and biotransformation of radioactive testosterone by the mouse prostate gland.** *Toxicol. Appl. Pharmacol. 26(4): 523-531; 1973.* (17 references)

The oral administration of varying doses (2.5 or 5 mg/kg daily X 10) of dieldrin led to significant reductions in the accumulation of radioactive androgen by the mouse prostate gland. This was reflected not only by a reduction in the total accumulation of tritiated steroid ([^{3}H]T) by prostate gland, but also by a decrease in the concentration of dihydrotestosterone ([^{3}H]DHT). The ratio of [^{3}H]T to [^{3}H]DHT remains, however, similar in treated and control groups. The doses of dieldrin used had little effect upon sex accessory organ weights or prostatic fructose concentration. Dieldrin administration failed to alter gonadal weight. There was no change in the hepatic formation of radioactive dihydrotestosterone, androstanediol, or androstenedione from [1,2-^{3}H]testosterone in the dieldrin-treated animals, but dieldrin did produce increases in liver androgen hydroxylase activity. While the amounts of dieldrin used in these studies were quite high, the results, nevertheless, indicate that this organochloride could represent a potential deleterious chemical from the standpoint of the male reproductive system. (Author abstract by permission)

74-0951. Berndt, W. O.; Koschier, F. (Dept. Pharmacol. Toxicol., Dartmouth Med. Sch., Hanover, NH 03755). **In vitro uptake of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) by renal cortical tissue of rabbits and rats.** *Toxicol. Appl. Pharmacol. 26(4): 559-570; 1973.* (30 references)

The active transport of 2,4-D and 2,4,5-T by renal cortical slices of rats and rabbits has been characterized with in vitro techniques. Renal cortical slices, prepared from both species, accumulate 2,4-D and 2,4,5-T,

although greater uptake was noted with rabbit tissue. Nitrogen and various metabolic inhibitors reduced the uptakes. This indicates that these processes are energy dependent. The enhancement of accumulation by the addition of certain metabolic substrates, e.g. acetate, lactate, provides evidence that both organic acid herbicides are transported by the renal organic anion mechanism. Potassium-ion stimulation also supports this concept. It is concluded that the renal tubular transport by the organic anion mechanism may account for the relatively rapid disappearance of these compounds, which in turn may contribute to their low toxicity. (Author abstract by permission)

74-0952. Weil, C. S.; Woodside, M. D.; Bernard, J. B.; Condra, N. I.; King, J. M.; Carpenter, C. P. (Carnegie-Mellon Univ., Pittsburgh, PA 15213). **Comparative effect of carbaryl on rat reproduction and guinea pig teratology when fed either in the diet or by stomach intubation.** *Toxicol. Appl. Pharmacol. 26(4): 621-638; 1973.* (11 references)

A 3-generation rat reproduction study, terminating with teratologic and mutagenetic studies included groups receiving carbaryl in the diet at maximum daily doses of 200 mg/kg while other groups concurrently received daily po intubation of carbaryl in doses as high as 100 mg/kg. A guinea pig teratology study was also run with maximum levels of carbaryl of 300 mg/kg in the diet or 200 mg/kg po. Previous publications of repeated po intubation reported rat reproduction effects from carbaryl at 2 mg/kg and guinea pig teratology at a maternal toxic level of 300 mg/kg. The concurrent study of administration of carbaryl by daily po administration or by dietary inclusion resulted in neither rat teratology or mutagenesis nor guinea pig teratology in the animals that received the maximum dosage levels. However, the maximum po groups had severe toxic effects in both studies as contrasted to little or no effect at the maximum dietary levels for rat or guinea pigs and no effect at 25 mg/kg po to rats or 100 mg/kg po to guinea pigs. These studies verify the differences that result by deviation from certain proposed guidelines for experimental design. Therefore, the importance of mode of administration was demonstrated, thus verifying that dosage-related responses must be considered if results are to be used to predict safety for man. (Author abstract by permission)

74-0953. Yamagishi, T.; Fujimoto, C.; Takeba, K.; Morimoto, K.; Haruta, M. (Tokyo Metrop. Pub. Health Res. Lab., Tokyo, Japan). **[Effects of β-BHC on the mouse fetus.]** *Tokyo-To Eiseikyoku Gakkai-Shi (Rep. Tokyo Pub. Health Stud.) 50: 46-47; 1972.* (2 references) (Japanese)

Three groups of female ICR-JCL mice were treated with analytical-grade β-BHC, and the frequencies of abnormal fetuses and the β-BHC levels in maternal and fetal tissues were determined. The first group were given β-BHC in olive oil by subcutaneous injection at 5, 50, or 100 μg/g b.w. on days 2-6 of gestation. Similar injections were given to the second group on the 7th-11th days of gestation. The third group was fed a diet containing β-BHC at 5 mg/kg diet from about one month before mating to the day of fetus removal; these mice were also given β-BHC in olive oil p.o. at 50 or 100 μg/g body weight on the 6th-7th days of gestation. At the 18th day of gestation, the percentage of abnormal fetuses (dead or stillborn) in the first group was 47.3, 35.6, and 23.8% respectively, corresponding to the 100, 50, and 10 μg administration levels, compared to 23.6% in controls injected with olive oil alone. The percentages in the second group were 21.3, 24.6, and 30.0 respectively, corresponding to 100, 50, and 10 μg, compared to less than 20% in controls. The percentages in the third group were 25.8 and 24.0 respectively for animals receiving 100 and 50 μg, compared to 8.0% in controls and 11.3% in those fed only the β-BHC-containing feed. About one fifth to one eighth of the β-BHC in the mother seemed to have crossed the placenta into the fetus.

74-0954. Nepoklonov, A. A.; Metelitsa, V. K. (Author address not given). **Izucheniye vydeleniya amidofosa s molokom, raspredeleniya v organakh i vyvedeniya iz organizma zhivotnykh. [Studies of amidophos excretion in milk, distribution in organs and tissues, and removal from the animal organism.]** *Tr. Vses. Nauch.-Issled. Inst. Vet. Sanit. 35: 191-199; 1970.* (Russian)

The excretion of amidophos (crufomate) in milk of dairy cows, the distribution in various organs and tissues, and the elimination by cows, calves, and rabbits following administration in different forms were studied. Cows were sprayed with a 0.5% aqueous amidophos emulsion at a rate of 2 liters per animal. Thin-layer chromatographic and enzymatic agar diffusion analyses of milk samples for amidophos residues revealed 1-40, 1-36, 1, and 1 mg of amidophos per liter at 1, 3, 12, and 24 hr after spraying. The amidophos residues in milk of one cow at 2, 3, 5, 7, 8, 10, and 14 days after treatment were 0.8, 6.2, 0.9, 4, trace, trace, and 1 ppm. Three previously reported metabolites and one unidentified metabolite were detected. Milk samples to which 0.1 and 1 mg of amidophos had been added retained 30 and 50% of the amidophos during storage for 20 days at 6°C. Following i.m. administration of amidophos at 50 mg/kg body weight to rabbits, the amidophos residues in the urine, blood, muscles, heart, liver, kidney, and gastric wall were 3.3, 3, 0.5-1.5, 1.5, 3.3, 3, and 2.5 μg/kg 8 days after treatment. But no amidophos was detected on the 10th day. Thirty days after cutaneous application of amidophos at 1,000 mg per kg, residues were detected only in the muscles of the back (0.5 μg/kg), liver (trace), kidney (0.45 μg/kg), and skin (125 μg/kg). Traces of amidophos were detected in the muscles of the back, liver, kidney, and lungs of calves 29 days after skin application of amidophos at 40 mg/kg.

74-0955. Omarov, L. M. (Author address not given). **Issledovaniye toksichnosti ftalofosa dlya krolikov i krupnogo rogatogo skota pri naruzhnom primenenii. [Toxicity of externally applied phthalophos to rabbits and cattle.]** *Tr. Vses. Nauch.-Issled. Inst. Vet. Sanit. 35: 200-206; 1970.* (Russian)

The toxicity of cutaneously applied phthalophos (phosmet) suspensions and emulsions in rabbits and cattle was investigated in comparative studies. Spraying with 0.25-0.5% emulsions of phthalophos at rates up to 100 mg/kg body weight caused no effects in rabbits, while spraying with 4% and 6% emulsions corresponding to a dose of 320-480 mg/kg produced toxicosis and death. Single sprayings with 2, 3, and 4% phthalophos emulsions, corresponding to doses of 326, 456, and 600 mg/kg, caused toxicosis, while spraying with 6% emulsion (dose 708-963 mg/kg) also produced cholinesterase inhibition of up to 89% and death. Depending on the doses, varying degrees of hypersalivation, involuntary urination, intensified peristalsis, miosis, motor coordination disorders, anorexia, diarrhea, muscle tremor, lachrymation, dyspnea, and bradycardia were observed in such animals. Hyperemia of cutaneous vessels, lungs, liver, kidney, brain, and spleen; enlargement of the gallbladder; and hemorrhagic inflammation of the small intenstine were found at autopsy. Spraying cattle once a week with 3 liters of 0.25-0.5% emulsion caused no physiological or morphological changes, but it produced cholinesterase inhibition of 9.5% and 14.9-32.5%, respectively.

74-0956. Trifonova, G. K.; Zaytseva, L. D. (Ukr. Sci. Res. Inst. Exp. Vet., USSR). **Ob embriotoksicheskikh svoystvakh dikrezila. [On the embryotoxic effects of dicresyl.]** *Veterinariya (Moscow) 2: 102-104; 1973.* (Russian)

Dicresyl and its excretion in milk were studied in pregnant and lactating ewes and in pregnant rats to determine embryotoxic effects. Dicresyl residues were detected in the placenta and uterus of sacrificed albino rats fed 1/25 and 1/50 of the LD50 dose (630 mg/kg) for 5 to 10 days during pregnancy and in their fetuses. The rates of resorption, determined in pregnant rats fed dicresyl for 10 days in the first or second half of their pregnancy, were 50% and 14.3%. Dicresyl residue concentrations of 0.1-0.2 mg/kg in the placenta and 0.03-0.1 mg/kg in other tissues and organs were determined in ewes fed 2 and 5 mg/kg doses of dicresyl daily for 2.5 months during pregnancy. Milk samples taken from these ewes up to 3.5 months after parturition contained 0.15-0.2 mg of dicresyl per liter.

74-0957. Zhavoronkov, N. I.; Verkhovskiy, A. P.; Yevdokimov, S. M. (All-Union Inst. Exp. Vet., USSR). **Aktivnost' atsetilkholinesterazy pod deystviyem triallata. [The acetylcholinesterase activity as affected by triallate.]** *Veterinariya (Moscow) 3: 103-105; 1973.* (Russian)

Triallate was administered to rabbits at 450-500 mg/kg in a single oral dose; acetylcholinesterase activity in the cerebrum, cerebellum, medulla oblongata, and peripheral blood was studied by Hestrin's method from 6 hours to 15 days after dosing. The acetylcholinesterase inhibition was strongest with 23.1% for the first three days after poisoning in the medulla oblongata. The corresponding maximum rates of cholinesterase inhibition in the anterior lobes of the cerebrum and in the cerebellum were 19.1% and 16.8%, respectively. The acetylcholinesterase activities measured in the anterior lobes of the cerebellum, the cerebrum, and the medulla oblongata on the 15th day of poisoning were 80.5%, 103.7%, and 90.4%. The acetylcholinesterase activities measured in the erythrocytes 6, 24, and 72 hr and 4 and 10 days after poisoning were 77.8%, 58%, 74.1%, 41.1%, 54.8%, and 97%, respectively, as compared to the initial normal value. Pronounced disturbances in blood circulation (plethora of the blood vessels and pulmonary and cerebral edema), granular dystrophy of the parenchymal organs, and a few cases of myocardial dystrophy were found in dead and sacrificed animals.

74-0958. Nikolayev, K. A. (All-Union Inst. Exp. Vet., USSR). **Vliyaniye khlorofosa i fosfamida na aktivnost' fermentov golovnogo mozga. [The effect of trichlorfon and dimethoate on the enzyme activity of the brain.]** *Veterinariya (Moscow) 3: 105-106; 1973.* (Russian)

The effects of different concentrations of trichlorfon and dimethoate on the acetylcholinesterase and sodium-potassium-adenosine triphosphatase activity of rabbit brain homogenates were studied. The rates of acetylcholinesterase and sodium-potassium-adenosine triphosphatase inhibition due to 0.009 *M*, 0.0009 *M*, 0.00009 *M*, and 0.000009 *M* concentrations of trichlorfon were 100% and 84.15%, 99.1% and 61.95%, 93% and 57.7%, 71.7% and 45.5%, and 23.15% and 36.57%, respectively. The corresponding rates of acetylcholinesterase and sodium-potassium-adenosine triphosphatase inhibition due to identical dimethoate concentrations were 98.1% and 90.1%, 82.7% and 71.46%, 29% and 67.86%, and 15.8% and 44.2%. The respective trichlorfon and dimethoate concentrations and the rates of the acetylcholinesterase and sodium-potassium-adenosine triphosphatase inhibition were directly related.

74-0959. Loktionov, V. N,; Budarkov, V. A.; Kuznetsov, A. I.; Kuznetsova, N. V. (Kazan Inst. Vet., Kazan, USSR). **Toksikologicheskaya kharakteristika proizvodnykh dikhlorfenoksiuksusnoy kisloty. [Toxicological characterization of dichlorophenoxyacetic acid derivatives.]** *Veterinariya (Moscow) 5: 107-109; 1973.* (Russian)

An exhaustive toxicological study on the sodium and amine salts of 2,4-D was performed on mice, rats, chickens, and rabbits. The LD50 of the amine salt of 2,4-D in mice and rats was 300 and 1,200 mg/kg; that of

the sodium salt was 360 and 730 mg/kg; the LD50 value for the sodium and amine salts of 2,4-D in chickens, 655 and 1,950 mg/kg, respectively. Depression, muscular asthenia, tremor, motor coordination disorders, tachypnea, and profuse diarrhea were determined in chickens and rabbits fed 500 mg/kg or higher doses. The erythrocyte count and hemoglobin, thrombocyte, leukocyte, and neutrophil levels increased and lymphocyte levels decreased in chickens and rabbits. Doses of 60 mg/kg 2,4-D sodium salt sharply reduced hepatic glycogen level and increased the blood sugar level in chickens. 2,4-D amine salt caused slight enlargement of the lymph nodes, slight dilation of the heart, inflammatory changes in the mucosa of the respiratory and gastrointestinal tracts in rabbits, venous stasis, pulmonary edema, catarrhal gastroenteritis, glomerulonephritis, parenchymatous dystrophy of the liver and kidney, and pronounced plethora of the liver, kidney, and lung in chickens. Catarrhal inflammation and hemorrhages in the intestines, slight hepatomegaly, and fatty degeneration of the parenchymatous organs were determined in chickens chronically poisoned with 2,4-D sodium salt. High biological activity of the 2,4-D amine and sodium salts in both single and multiple administration is concluded.

74-0960. Clodi, P. H. (Sektion Gastroenterol., Zentrum fuer Innere Med. und Kinderheilkunde der Univ. Ulm, D-79 Ulm, Germany). **Die Entgiftungsfunktion der Leber. [Detoxification function of the liver.]** *Wien. Med. Wochenschr. 120(39): 651-654; 1970.* (18 references) (German)

The mechanism of the detoxifying action of the liver and the hepatic enzyme induction by certain poisons and drugs are described. Animal tests revealed a 25% reduction in the pentobarbital-induced sleep duration in animals whose fat contained 9 μg of DDT per gram. Similar phenomena were also observed in man. A single contact with DDT may cause persistent increase in the detoxifying capacity of the organism. The hexobarbital detoxifying capacity of animals previously injected with 200 mg of DDT per kg was 200 to 300% higher than in a control group after 5-10 days. Parathion, a practically nontoxic pesticide, is converted into toxic, cholinesterase-inhibiting paraoxon by the liver.

74-0961. Taimr, L.; Hanker, I. (Inst. Plant Protection, Praha 6-Ruzyne, Czechoslovakia). **Detoxication of DDT-^{14}C in field populations of *Meligethes aeneus* Fabr. (Coleoptera: Nitidulidae).** *Z. Angew. Entomol. 73(4): 422-439; 1973.* (21 references)

DDT resistance was observed in 3 out of 5 *M. aeneus* populations from rape stands in Bohemia in 1970, with resistance factors based on the most susceptible population tested of 23.3, 51.2, and 85.7. Beetles collected from the two susceptible populations metabolized 8.43 and 10.14% of the pesticide to DDE during a 12 hr exposure, while beetles from the most resistant population metabolized 21.90%. In other experiments DDT susceptibility and ability to degrade the pesticide were not extremely different in populations collected from DDT-treated rape and those collected from isolated mountain areas and uncultured wild mustard stands. Selection and mixing of populations has made it difficult to find a fully DDT-susceptible population. It is therefore not possible to determine whether or not improved capacity to degrade DDT is the only mechanism of resistance.

See also **74-0761** **74-0766** **74-0819** **74-0837** **74-1005**

74-0962. Auterhoff, H.; Ahlers, G. (Universitaet Tuebingen, Pharmazeutisches Institut, 74 Tuebingen, Germany). **Die Nachweisreaktion von DDT mit Xanthydrol. [Detection of DDT with Xanthydrol.]** *Arch. Pharm. (Weinheim, Ger.) 306(8): 631-633; 1973.* (4 references) (German)

The mechanism of the reaction of DDT with xanthydrol, potassium hydroxide, and pyridine, as used for the detection of DDT, was studied by thin-layer chromatography and electron-spin resonance spectrography. A mixture of xanthydrol, potassium hydroxide, and pyridine turns blue under boiling, and then red upon the addition of DDT. Both *p,p'*-DDT and *o,p'*-DDT give the same reaction, whereas this method was not usable for the detection of other chlorinated hydrocarbons, such as aldrin, dichloroethylene, and carbon tetrachloride. Formation of a metal ketyl from xanthydrol and potassium hydroxide was determined to be the first step in the analytical reaction. Formation of an electron donor-acceptor complex from the metal ketyl and DDE was demonstrated. The color reaction provoked by DDT was optimal at a xanthydrol:DDT molar ratio of 1:1; excess DDT interfered with the reaction due to the formation of hydrochloric acid from potassium hydroxide and DDT. The limit of detectability was 0.2 mg of DDT.

74-0963. Subach, D. J.; Bell, M. E. B. (Texas A. & M. Univ., College Station, TX 77843). **An analytical procedure for the determination of pesticides in food.** *J. Chem. Educ. 50(12): 855-856; 1973.* (5 references)

A method was developed for the analysis of organochlorine pesticides and significant alteration products in food samples. The method is also suitable for demonstrating multiresidue methodology to advanced students of chemical analysis. Fortified samples were extracted in propylene carbonate, filtered, dried, and chromatographed on a column of Florisil. Eluate was analyzed by TLC on alumina or by GC, and minimum recoveries of 80% were obtained.

74-0964. Hinge, D. C. (Lee Conservancy Catchment Board, Waltham Cross, Herts. EN8 8LX, England). **Sampling and analysis of chemical pollutants in river water.** *Chem. Ind. (London) (15): 727-732; 1973.* (14 references)

The laboratory of the Lee Conservancy Catchment Board analyzes river water monthly for pesticides and other chemicals and weekly for determination of suspended solids, pH, and other factors affecting water quality. The extent of analytical investigations sometimes necessary when contamination is found is illustrated by the incident of endosulfan release from a pesticide manufacturing operation. The A isomer of endosulfan was found on initial analysis, which involved hexane extraction, clean-up, and GLC. When a more polar solvent was used, the B isomer was also identified in samples. Oxidation to endosulfan sulfate and subsequent analysis provided additional proof of the presence of the pesticide.

74-0965. Uhnak, J.; Sackmauerova, M.; Szokolay, A.; Madaric, A. (Res. Inst. Hyg., Bratislava, Czechoslovakia). **Gaschromatographische Bestimmung der Rueckstaende der Isomere von 1,2,3,4,5,6-Hexachlorzyklohexan im Milchfett. [Gas-chromatographic determination of residues of 1,2,3,4,5,6-hexachlorocyclohexane in milk fat.]** *Chem. Zvesti 27(1): 128-134; 1973.* (15 references) (German)

A method for the gas-chromatographic determination of residual quantities of the α- β-, γ-, and δ-isomers of BHC in milk fat is described. The extracts and eluates are condensed according to a standard method to dry in a rotary vacuum distiller at 50°C to attain a yield of 85.6-98.5% for each isomer. The four isomers of BHC, as well as DDT and its metabolites, are separated on the stationary phases XE-60, DOW-11, OV-17, and QF-1. The separation was best on a column containing the mixed packing 1.5% OV-17 with 2% QF-1 on Chromosorb W. The standard deviation ranged from ±0.017 to ±0.004 mg/kg, with a variation coefficient of 3-10.42%. The limit of detectability for α- and γ-BHC was 0.0001 mg/kg.

74-0966. Reinhardt, G.; Zink, P. (Inst. fuer Rechtsmed., Univ. Erlangen-Nuernberg, Erlangen, Germany). **Analytische Probleme bei der polarographischen Thalliumbestimmung in kleinen Organproben. [Analytic problems in the polarographic determination of thallium in small organ samples.]** *Beitr. Gerichtl. Med. 30: 371-375; 1973.* (11 references) (German)

A method for the determination of thallium residues in small human or animal organ samples by pulse polarography with simple preparation of samples is described. The organ samples to be analyzed are digested by a combined wet method, using hydrogen peroxide, sulfuric acid, nitric acid, and ferrous ions to achieve oxidation by means of hydroxyl radicals. The residue obtained after evaporation of the oxidizing agents is transferred into 0.1 *N* hydrochloric acid which serves as a supporting electrolyte for pulse polarography. Wet digestion and the use of ultrapure reagents, as well as the use of HCl as supporting electrolyte help minimize interference due to lead. The detection limit of thallium in 0.1-2 g liver and kidney samples is about 0.1 μg. Physiological thallium concentrations of about 0.001 μg/g wet weight cannot be measured by this method. Positive polarographic detection of thallium in human organs is indicative of thallium poisoning. The method described is also suitable for the simultaneous determination of cadmium, copper, and zinc.

74-0967. Kroeller, E. (Bundesgesundheitsamt, Max von Pettenkofer-Institut, Abteilung Lebensmittelchemie,

Berlin-Dahlem, Germany). **Untersuchungen zur Restmengenbestimmung von Trichloracetonitril in Getreide. [Studies concerning the determination of trichloroacetonitrile residues in cereals.]** *Deut. Lebensm.-Rundsch. 69(8): 280-282; 1973.* (6 references) (German)

A colorimetric method for the determination of trichloroacetonitrile (Tritox), a fumigant used for pest control in grain, is described. After extraction from the grain with pentane, trichloroacetonitrile is purified and concentrated by distillation. It is then hydrolyzed with potassium hydroxide, and the cyanide ion thus obtained is determined photometrically with pyridine-benzidine as a red polymethine dye, in a 2 cm-cuvette at 524 nm against water. Due to the very unfavorable molar ratio of 5.55:1 between the active substance and the cyano ion, the limit of detection is only 0.1 ppm, but this is sufficient for practical purposes. Fumigation tests with wheat and rice have shown that trichloroacetonitrile is bound to a considerable extent by the components of grain, probably proteins, forming metabolites whose structure and physiological effects are as yet unknown.

74-0968. Guntchev, C.; Dimchev, T. (Inst. Plant Protection, Kostinbrod, Bulgaria). **Application of the neutron-activation analysis in the instrumental determination of chlorine-containing pesticides.** *Dokl. Sel'skokhoz. Akad. Sofia 5(3): 193-197; 1972.* (5 references)

A reliable technique was developed for the serial determination of chlorine-containing pesticides in biological samples, and formulae were derived to permit calculation of the concentrations of residues on the basis of the results of two measurements. Plant and soil samples were extracted with diethyl ether in a Soxhlet apparatus. The extracts were washed with bi-distilled water and then evaporated on tarred polyethylene pads. In sealed polyethylene boxes the samples were analyzed by neutron activation analysis. Soil and tobacco from test plots treated with DDT and lindane contained 12.8 to 51.7 and 59.6 to 336.0 10^{-6} g/g total organochlorine residues, respectively.

74-0969. Ukai, S.; Hirose, K.; Kawase, S. (Gifu Coll. of Pharm., Gifu Prefect., Japan). **[Forensic chemical studies on drugs. I. Determination of diquat and paraquat in aqueous herbicide preparations by gas chromatography.]** *Eisei Kagaku (J. Hyg. Chem.) 19(5): 281-286; 1973.* (11 references) (Japanese)

Diquat and paraquat can be determined, separately and simultaneously, in aqueous herbicide preparations by gas chromatography (hydrogen flame ionization detector) of the reduction products obtained by treatment with sodium borohydride. Solutions of the reduction products in ethyl acetate were injected onto the gas chromatograph, equipped with a glass column containing Gas-Chrom Z coated with 5% KOH and 5% PEG-6000, at 180° for the usual individual determination or 165° for simultaneous determination. The conditions provided satisfactory separation of the reduction products of diquat and paraquat. When *o*-phenylenediamine is used as the internal standard, the procedure is suitable for detecting 5-65 μg/ml of paraquat and diquat. The principal compounds isolated from diquat and paraquat reduction products were the ethylene-octahydrobipyridyl and dimethyl-octahydrobipyridyl derivatives. (From author summary)

74-0970. Mizutani, T.; Matsumoto, M. (Kyoto City Inst. of Pub. Health, Kyoto, Japan). **[Separation and determination of polychlorinated biphenyls and DDE by oxidation in solid support.]** *Eisei Kagaku (J. Hyg. Chem.) 19(5): 287-292; 1973.* (8 references) (Japanese)

A convenient, rapid method for the oxidative derivatization of DDE to *p,p'*-dichlorobenzophenone (DCBP) was developed for use in separation of DDE from polychlorinated biphenyls (PCB). An aliquot of the cleaned-up extract was applied to a microcolumn, packed with layers of silica gel/water and silica gel/chromium trioxide/50% acetic acid as a solid support. The microcolumn was heated in an oven at 100°C for 2 hours; the compounds were fractionally eluted by dry column chromatography. PCBs were eluted in the *n*-hexane fraction, and DCBP produced by oxidation was eluted in the ethyl ether-hexane (15:85) fraction. The eluates could be used for electron capture gas chromatographic analysis without further treatment. Production of DCBP from DDE was practically quantitative in the 0.1-3 μg range. From 74 to 99% of the PCBs present in the 0.5-3 μg range were recovered, depending on the average chlorine content of the individual compound.

74-0971. Kaneda, Y.; Nakamura, K.; Nakahara, H.; Iwaida, M. (Nat. Inst. Hyg. Sci., Osaka, Japan). **[Gas chromatographic analysis of pesticide residues in food. IV. A rapid screening system for organophosphorus pesticides.]** *Eisei Kagaku (J. Hyg. Chem.) 19(6): 1973.* (10 references) (Japanese)

Gas chromatography with a flame photometric detector was employed for determining residues of eight organophosphorus pesticides in vegetables. The analytical procedure also permitted determination of organochlorines in an aliquot of the benzene extract by chromatography with an electron capture detector. Residues after evaporation of the benzene extract are taken up in ethyl acetate for determination of diazinon, malathion, and parathion; and in acetonitrile for determination of phorate, ronnel, fenitrothion, methyl parathion, and ethion. The quantity of insecticide present in the sample solution was estimated from the log-log plot of the peak area response versus pesticide concentration. Three parameters were found useful for identification: retention time, comparison of peak area response in P and S modes, and response ratio.

74-0972. Ogamo, A.; Kasahara, H.; Nagasawa, K. (Sch. Pharm. Sci., Kitasato Univ., Tokyo, Japan). **[Thin-layer chromatography of carbamate insecticides.]** *Eisei Kagaku (J. Hyg. Chem.) 19(6): 340-344; 1973.* (Japanese)

Thin-layer chromatographic separation and detection methods were examined for 12 *N*-methylcarbamate insecticides, widely used in Japan, on silica gel, alumina, and polyamide layers. Two chromatographic systems were found most suitable for detection of these compounds: acetone-hexane (1:4) on an alumina layer and water-methanol (5:5) on a polyamide layer. The most suitable detection reagents are *p*-nitrobenzenediazonium fluoroborate-KOH and bromine-fluorescein. The detection limits using *p*-nitrobenzenediazonium fluoroborate-KOH on alumina layers were as follows: carbaryl, 0.02 μg; CPMC, 0.02 μg; aprocarb, 0.1 μg; EMPC, 0.2 μg; APC, 10 μg; MPMC, 0.2 μg; XMC, 0.05 μg; BPMC, 0.1 μg; MTMC, 0.2 μg; MIPC, 0.1 μg; and 3-methyl-5-isopropylphenyl *N*-methylcarbamate > 50 μg. *Rf* values for these compounds using the acetone-hexane (1:4) solvent system and the alumina layer were 0.1-0.7.

74-0973. Michel, H. O.; Gordon, E. C.; Epstein, J.* (Defense Research Branch, Edgewood Arsenal, Aberdeen Proving Ground, MD 21010). **Detection and estimation of isopropyl methylphosphonofluoridate and *O*-ethyl *S*-diisopropylaminoethylmethylphosphonothioate in seawater in parts-per-trillion level.** *Environ. Sci. Technol. 7(11): 1045-1049; 1973.* (9 references)

A procedure is described for the estimation of two very potent anticholinesterase chemicals, viz., isopropyl methylphosphonofluoridate (GB, sarin) and *O*-ethyl *S*-diisopropylaminoethylmethylphosphonothioate (VX) in seawater in concentrations at the parts-per-trillion level by an enzymatic technique. Kinetic constants for the reaction of other anticholinesterases with two sources of cholinesterase and for the reaction of the cholinesterases with several substrates are given. With these data, the reader can select conditions for the development of procedures for estimating very low concentrations of these anticholinesterases in water. (Author abstract reprinted by permission of the American Chemical Society)

74-0974. Manning, R. J. (Beckman Instruments Inc., Fullerton, CA). **Infra-red spectrophotometry in pollution analysis.** *Environ. Pollut. Manage. 2(7): 265-268; 1972.* (4 references)

An IR spectrophotometer, a valuable tool in pollution analysis, represents a minimum investment in equipment, is easily maintained, and does not require a controlled environment. Application to pesticide analysis is facilitated by an accessory which permits collection of GC fractions for IR scanning. A quantity of 10 μg of DDT or other pesticide can be trapped in a 1 mm KBr pellet for positive identification. A number of models are well suited to microsample analysis because of the small beam size at the sample position. Satisfactory curves were obtained with 0.03 mg dieldrin and 10 μl of parathion insecticide.

74-0975. Thielemann, H. (Halberstadt, DDR). **Trennung und Identifizierung der Isomeren des Hexachlorcyclohexans an Fertigfolien UV 254 fuer die Duennschicht-Chromatographie. [Separation and identification of isomers of hexachlorocyclohexane on ready-made sheets UV 254 for thin-layer chromatography.]** *Fresenius' Z. Anal. Chem. 266(3): 208; 1973.* (2 references) (German)

Various methods are described for the separation and identification of the BHC isomers on UV 254 ready-made sheets intended for thin-layer chromatographic analysis. The sheets are composed of silicagel with luminescence indicator as sorbent on aluminum foil and starch as binding agent. Six different BHC isomers can be separated and identified by means of such solvent systems as 5:5 mixture of petroleum ether with carbon tetrachloride, 80:20 mixture of cyclohexane with chloroform, 10:0.5 mixture of heptane with isopropanol, and *n*-hexane, followed by spraying with 0.1% diphenyl solution in acetone and subsequent UV irradiation. Identification is also possible by means of 0.02% rhodamine B solution with subsequent additional spraying with 10% sodium carbonate solution and UV irradiation for about 5 min; or by the use of 0.04 g of bromcresol blue dissolved in 100 ml ethanol as visualizing agent. A combination of 10% silver nitrate in water with 0.2 g of sodium fluorescein in ethanol gives dark spots against a yellowish-green fluorescing background.

74-0976. Thielemann, H.** (Halberstadt, Wasserturmstrasse 10, DDR). **Ueber die Verwendung von Fertigfolien bei der semiquantitativen duennschicht-chromatographischen Bestimmung von Gesamt-DDT (*p,p'*-DDT und *p,p'*-DDE) in der Humanmilch. [Use of ready-made sheets for the semi-quantitative thin-layer chromatographic determination of total DDT (*p,p'*-DDT and *p,p'*-DDE) in human milk.]** *Fresenius' Z. Anal. Chem. 266(4): 287-288; 1973.* (1 reference) (German)

A thin-layer chromatographic method is described for the semi-quantitative determination of total DDT in human milk by means of Silufol ready-made sheet. Extraction of DDT from milk and butter samples is done by means of ethanol and hexane. The ready-made sheet to be used for TLC analysis only needs one washing with acetone and does not require activation. Silver nitrate in distilled water, combined with ammoniacal solution, and diluted with acetone is used as visualizing reagent for the identification of DDT. Among a total of 187 human milk samples investigated 6.0% were DDT-free. Total DDT residue levels in 21.1%, 23.9%, 10.7%, 23.4%, 3.8%, 8.7%, 1.1%, 0.6%, and 0.6% of the samples were 0.07 ppm, 0.13 ppm. 0.17 ppm, 0.25 ppm, 0.34 ppm, 0.5 ppm, 1.25 ppm, 2.5 ppm, and 5.0 ppm, respectively.

74-0977. Herzel, F.; Lahmann, E. (1 Berlin 33, Corrensplatz 1, Germany). **Beitrag zur quantitativen Bestimmung von Pestiziden in Luft. [Study on the quantitative determination of pesticides in air.]** *Gesundh.-Ing. 94(9): 275-279; 1973.* (8 references) (German)

The suitability of absorption and adsorption sampling methods for the gas chromatographic analysis of low pesticide concentrations in the air was studied. Standard impingers with 300 ml volume were used for the absorption tests. Two impingers were connected in tandem and two in parallel; each was filled with 100 or 50 ml of ethylene glycol. The rates of absorption in the first stage of the impinger were 79-91.5% for lindane, 45-89% for aldrin, 83-92% for dieldrin, and 86-100% for DDT. The corresponding retention rates determined for the second stage were 8.5-48% for lindane, 11-48% for aldrin, 8-17% for dieldrin, and 0-14% for DDT. Volatile organic solvents were unsuitable for the collection of insecticides from air. The adsorption of the organochlorine pesticides above, as well as of parathion, dichlobenil, *N*-methyl-*N*-methoxy-*N'*-4-chlorophenylurea, and a mixture of polychlorinated biphenyls, was studied using a portable sampler on silica gel, alumina, and a carrier coated with rigid polyethylene. Polyethylene-coated silica gel was found to be the best adsorbent, retaining all pesticides in the first filter of a tandem filter set-up.

74-0978. Hutzinger, O.; Safe, S. (Atlantic Reg. Lab., Nat. Res. Council Canada, Halifax, Nova Scotia, Canada). **Analysis of chlorinated aromatic hydrocarbons by exhaustive chlorination: qualitative and structural aspects of the perchloro-derivatives of biphenyl, naphthalene, terphenyl, dibenzofuran, dibenzodioxin and DDE.** *Int. J. Environ. Anal. Chem. 2: 95-106; 1972.* (30 references)

Antimony pentachloride-iodine and the BMC reagent, sulfuryl chloride-ammonium chloride-disulfur dichloride, were the most effective and convenient reagents tested for exhaustive chlorination of aromatic pesticides and related compounds. With either reagent, mixtures were heated for several hours and the product precipitated with HCl. Mass spectra of the DDE derivative indicated the formation, in good yield, of a single product. GC analysis showed several products, possibly because of thermal degradation. Perchlorinating reagents decomposed aldrin and dieldrin into polar products that remained at the origin in a silica gel-hexane TLC system. The method is useful in determination of a mixture of compounds like polychlorinated biphenyls, simplifying analysis, and improving sensitivity. It also may serve as a confirmatory test for such compounds as DDE.

74-0979. Reeves, R. G.; Woodham, D. W.* (Plant Protection and Quarantine Programs, Brownsville, TX 78520). **Gas chromatographic analysis of methomyl residues in soil, sediment, water, and tobacco utilizing the flame photometric detector.** *J. Agr. Food Chem. 22(1): 76-78; 1974.* (6 references)

An improved method for the gas chromatographic analysis of methomyl in soil, sediment, water, and tobacco is described. Methomyl is extracted from soil, sediment, and water with dichloromethane and from tobacco with a mixture of 97.5% dichloromethane and 2.5% benzene. Soil, sediment, and water extracts are further purified by elution through a chromatographic column of activated Florisil, while tobacco extracts are purified utilizing a coagulation procedure. The purified concentrated extracts are analyzed on a gas–liquid chromatograph (GLC) equipped with a 394-mμ sulfur interference filter. Residues as low as 0.05 ppm may be detected in tobacco, soil, sediment, and water samples. The procedure is simple, reliable, and rapid for environmental samples of this type. (Author abstract reprinted by permission of the American Chemical Society)

74-0980. Payne, W. R., Jr.; Pope, J. D., Jr.; Benner, J. E. (Southeast Environ. Res. Lab., Environ. Protect. Agency, Athens, GA 30601). **An integrated method for trifluralin, diphenamid, and paraquat in soil and runoff from agricultural land.** *J. Agr. Food Chem. 22(1): 79-82; 1974.* (7 references)

An integrated method has been developed involving gas chromatographic and colorimetric techniques for the determination of admixed residues of the herbicides trifluralin (α,α,α-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toludine), diphenamid (*N*,*N*-dimethyl-2,2-diphenylacetamide), and paraquat (1,1-dimethyl-4,4-bipyridinum dichloride) in soil and runoff samples. The use of the Coulson electrolytic conductivity detector permits simultaneous gas chromatographic determination of trifluralin and diphenamid, and eliminates the necessity for cleanup of soil and sediment samples. A modification of the standard colorimetric method for paraquat reduces analysis time and minimizes sample attendance. Recoveries from spiked soil and sediment ranged from 86 to 94% for trifluralin, 95-96% for diphenamid, and 91-99% for paraquat. With spiked water samples recoveries ranged from 82 to 91% for trifluralin, 90-95% for diphenamid, and 83-94% for paraquat. Recoveries from spiked runoff (water and sediment combined) samples ranged from 82 to 84%, 95-97%, and 94-107% for trifluralin, diphenamid, and paraquat. (Author abstract reprinted by permission of the American Chemical Society)

74-0981. Miller, V. L.; Gould, C. J.; Csonka, E. (Dept. Agr. Chem., Washington State Univ., Western Washington Res. Ext. Cent., Puyallup, WA 98371). **Estimation of thiabendazole in the milligram and submilligram ranges.** *J. Agr. Food Chem. 22(1): 90-92; 1974.* (6 references)

A procedure is described for the estimation of thiabendazole suspensions of ~0.1-2.0 mg/ml concentra-

tion. The procedure depends on the extraction of a copper-thiabendazole-tetramethylguanidine complex by chloroform from an aqueous suspension at pH 12.0-12.5. Absorbance of the complex is measured at 350-400 nm, or the color may be compared with artificial permanent standards. In a modification that permits estimation of ~2 μg/ml, absorbance of the copper-thiabendazole-tetramethylguanidine complex in chloroform is measured at 311 nm. (Author abstract reprinted by permission of the American Chemical Society)

74-0982. Miller, V. L.; Gould, C. J.; Csonka, E. (Dept. Agr. Chem., Washington State Univ., Western Washington Res. Ext. Cent., Puyallup, WA 98371). **Estimation of benomyl in the milligram range.** *J. Agr. Food Chem. 22(1): 93-95; 1974.* (9 references)

A procedure is described for the estimation of 2.0-12.0 mg of benomyl. The benomyl is extracted from aqueous suspension into chloroform at pH ~10.7 as a copper-benomyl-2-dimethylamino-2-methyl-1-propanol complex. The absorbance of its chloroform solution is measured at 420 nm and compared with the absorbance of known amounts of benomyl. A minor modification will estimate as little as 200 μg of benomyl. The green color of the copper-benomyl-2-dimethylamino-2-methyl-1-propanol complex in chloroform may be compared with permanent standards to estimate the benomyl. This latter approach permits the rapid estimation of benomyl in tanks for treatment of agricultural products without the use of a spectrophotometer. (Author abstract reprinted by permission of the American Chemical Society)

74-0983. Lawrence, J. F. (Food and Nutrition Div., Food Res. Lab., Health Protection Branch, Tunney's Pasture, Ottawa, K1A OL2, Canada). **Comparison of extraction methods for triazine herbicides in root crops using electrolytic conductivity detection.** *J. Agr. Food Chem. 22(1): 137-140; 1974.* (19 references)

A number of extraction methods for the analysis of triazine herbicides (atrazine, propazine, simazine, sencor (metribuzin), prometone) in foods, soil, and water were compared for gas chromatographic electrolytic conductivity determination in root crops (potato, carrot, turnip, beet, and parsnip). All of the methods produced similar results although they differed in the use of reagents and cleanup techniques. The use of the nitrogen-specific detection system made the hexane partition and column cleanup steps unnecessary, thus shortening analysis time considerably. The method of choice consisted of methanol extraction, followed by partitioning between water and chloroform. The chloroform extract was concentrated for direct GLC analysis. Interferences appeared only as irregular changes in baseline. No interfering peaks were observed for any of the triazines in the crops studied at 0.02 ppm or greater. (Author abstract reprinted by permission of the American Chemical Society)

74-0984. Lewis, D. L.; Paris, D. F. (Southeast Environ. Res. Lab., Nat. Environ. Res. Cent.-Corvallis, Environ. Protect. Agency, Athens, GA 30601). **Direct determination of carbaryl by gas-liquid chromatography using electron capture detection.** *J. Agr. Food Chem. 22(1): 148-149; 1974.* (5 references)

A reproducible direct method for simultaneous determination of small quantities (0.2-15 ng) of carbaryl and its hydrolysis product, α-naphthol, is described. Gas-liquid chromatography using electron capture detection, which improves sensitivity over other direct methods of carbaryl determination, has not been previously described. (Author abstract reprinted by permission of the American Chemical Society)

74-0985. Bowes, G. W.; Lewis, J. A. (Toxic Chem. Sect., Can. Wildl. Serv., Ottawa, Ontario, Canada K1A OH3). **Extraction of polychlorinated biphenyls: evaluation of a column technique applied to polar bear and seal tissue.** *J. Ass. Offic. Anal. Chem. 57(1): 138-144; 1974.* (8 references)

A column extraction procedure was evaluated for the extraction of polychlorinated biphenyls (PCB) from polar bear and seal liver and fat tissue. DDE (2,2-bis (*p*-chlorophenyl)-1,1-dichloroethylene) was also present in these tissues, and was quantitated for comparative purposes. Two solvent systems were compared: hexane and chloroform-methanol. The chlorinated hydrocarbons were also separated from the liver and fat by digestion of tissue in hot perchloric-glacial acetic acid, and treatment of tissue with acetone and hot isopropanol (considered to be an exhaustive extraction method for lipid). Six replicate extractions were performed for each of the 4 procedures applied to the 4 tissues. The results suggest that the column technique is excellent for extraction of these chlorinated hydrocarbons from animal tissue. Hexane eluted through a sodium sulfate-tissue mixture in a column was as effective in extracting PCB and DDE from polar bear and seal fat as the standard method of comparison (acetone-isopropanol), and slightly less effective (2-4%) in recovering them from liver. These results also indicate that PCB and DDT compounds are associated with the nonpolar lipid component in the cell. A fraction collection study with polar bear liver and fat shows that hexane removes the compounds rapidly from the 2 tissue types. Most of the PCB and DDE is eluted in the first 50 ml. (Author abstract by permission)

74-0986. Smart, N. A.; Hill, A. R. C.; Roughan, P. A. (Ministry Agr., Fish. Food, Plant Pathol. Lab., Harpenden, Herts., England). **Chlorinated hydrocarbon pesticide residues in foodstuffs: comparison of methods.** *J.*

Ass. Offic. Anal. Chem. 57(1): 153-164; 1974. (15 references)

The AOAC, de Faubert Maunder et al., and Wood methods have been examined for determining BHC, aldrin, heptachlor, DDT, and their major metabolites in milk, butter, cheese, and eggs. Also, the AOAC and the Laboratory of the Government Chemist (UK) methods have been investigated for these pesticides in apples, and both of the latter methods, together with a current EEC method, have been evaluated for measuring the pesticides in potatoes, carrots, and cabbages. Recoveries for these methods were determined by using samples with both added and incurred pesticide residues. There were no gross discrepancies in the results obtained by the different methods, although for certain foodstuffs and in certain situations some methods appeared preferable to others. (Author abstract by permission)

74-0987. MacNeil, J. D.; MacLellan, B. L.; Frei, R. W. (Trace Anal. Res. Cent., Dept. Chem., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Thin layer chromatography and in situ fluorometry for the quantitative determination of dimethoate and malathion in lettuce.** *J. Ass. Offic. Anal. Chem. 57(1): 165-167; 1974.* (7 references)

Dimethoate and malathion in spiked lettuce extracts are separated by thin layer chromatography on silica gel followed by in situ fluorometric determination. Fluorescence is produced by spraying the developed chromatogram with a palladium chloride-calcein reagent. A ligand exchange occurs in which the palladium complexes preferentially with the sulfur in the pesticide, releasing the metal-fluorochromic indicator calcein. For dimethoate, a linear response is obtained for 10-100 ng/spot and the need for a preliminary cleanup procedure is eliminated. (Author abstract by permission)

74-0988. Gabica, J.; Watson, M. Benson, W. W. (Idaho Community Study on Pesticides, Dept. Agr. Lab., Boise, ID 83702). **Rapid gas chromatographic method for screening of pesticide residues in milk.** *J. Ass. Offic. Anal. Chem. 57(1): 173-175; 1974.* (7 references)

A rapid version of the official AOAC milk extraction method, modified to exclude lengthy chromatographic cleanup, is described. Lipid-soluble material is extracted with a diethyl ether-hexane mixture. The concentrated hexane extracts are analyzed by gas chromatography, providing relatively sensitive results with a minimum of interfering extraneous peaks. This method may be useful in screening large numbers of samples and indicating those that may require more thorough analysis. (Author abstract by permission)

74-0989. Goerlitz, D. F.; Law, L. M. (U.S. Geol. Surv., Menlo Park, CA 94025). **Determination of chlorinated insecticides in suspended sediment and bottom material.** *J. Ass. Offic. Anal. Chem. 57(1): 176-181; 1974.* (21 references)

Chlorinated hydrocarbon insecticides in suspended sediment and bottom material are extracted with acetone-hexane solvent, with the extractants added separately. Co-extractives, including polychlorinated biphenyls and polychlorinated naphthalenes, are isolated by adsorption chromatography. Sulfur is removed by precipitation. Mean recoveries from 8 spiked samples ranged from 75 to 99% for 9 chlorinated hydrocarbon insecticides. An average recovery of 97.9% was obtained for bottom material samples contaminated with chlorinated hydrocarbons. Recoveries were compared with those obtained by exhaustive extraction of the contaminated samples. (Author abstract by permission)

74-0990. Braun, H. E. (Provincial Pestic. Residue Testing Lab., Ontario Min. Agr. Food, Guelph, Ontario N1G 2W1, Canada). **Gas-liquid chromatographic determination of residues of chlorpyriphos and leptophos, including their major metabolites, in vegetable tissue.** *J. Ass. Offic. Anal. Chem. 57(1): 182-188; 1974.* (12 references)

A method is described for the determination of residual chlorpyrifos (*O,O*-diethyl *O*-3,5,6-trichloro-2-pyridyl phosphorothioate) and leptophos (*O*-(4-bromo-2,5-dichlorophenyl) *O*-methyl phosphonothioate), and their respective oxygen analogs and hydrolytic metabolites, in field-treated vegetables. Samples are extracted by blending with acetonitrile followed by liquid-liquid partitioning between benzene and aqueous sodium carbonate to separate the parent compounds and oxygen analogs from the hydrolytic metabolites. Both fractions are individually cleaned up on silica gel which also serves to fractionate the parent compounds from their oxygen analogs as the result of column hydrolysis of the oxygen analogs. Chlorpyrifos and leptophos are determined by flame photometric gas-liquid chromatography (GLC); the residual and derived hydrolysis products are derivatized with trimethylsilyl acetamide and determined by electron capture GLC. Overall recoveries from fortified samples averaged 95% for the parent compounds and 85% for the oxygen analogs and hydrolytic metabolites. Detection limits approximated 0.005 ppm for chlorpyrifos and leptophos, 0.002 ppm for the oxygen analogs, and 0.001 ppm for the hydrolytic metabolites. (Author abstract by permission)

74-0991. Leary, J. B. (Ortho Div., Chevron Chemical Co., Richmond, CA 94804). **Gas-liquid chromatographic determination of acephate and Ortho 9006 residues in crops.** *J. Ass. Offic. Anal. Chem. 57(1): 189-191; 1974.*

A gas chromatographic method is described for determining acephate (*O,S*-dimethyl acetylphosphoramidothioate) and a metabolite, Ortho 9006 (*O, S*-dimethyl phosphoramidothioate), in a variety of crops. After extraction of the sample with ethyl acetate, the solvent

is evaporated, and an ether solution of the residue is passed through a silica gel column to remove interferences. Acephate and Ortho 9006 are eluted from the column with 10% methanol in ether and measured simultaneously by programmed temperature gas chromatography, using an alkali flame ionization detector. (Author abstract by permission)

74-0992. Ramsteiner, K.; Hoermann, W. D.; Eberle, D. O. (Agrochem. Div., Ciba-Geigy Ltd., Basel, Switzerland). **Multiresidue method for the determination of triazine herbicides in field-grown agricultural crops, water, and soils.** *J. Ass. Offic. Anal. Chem. 57(1): 192-201; 1974.* (27 references)

A gas chromatographic multiresidue method is described for the following triazine herbicides: ametryne, atratone, atrazine, desmetryne, methoprotryne, GS-13529 (terbuthylazine), GS-14254 (isobumeton), terbutryne, prometone, prometryne, propazine, and simazine. The method consists of a methanol extraction, cleanup on an alumina column, and determination on a Carbowax column with nitrogen-, sulfur-, and chloride-specific detectors. Extraction and recovery data are given. (Author abstract by permission)

74-0993. Pope, J. D., Jr.; Benner, J. E. (Southeast Environ. Res. Lab., Environ Protect. Agency Athens, GA 30601). **Colorimetric determination of paraquat residues in soil and water.** *J. Ass. Offic. Anal. Chem. 57(1): 202-204; 1974.* (10 references)

A modified colorimetric method is presented for the determination of paraquat in agricultural runoff samples. The soil extraction step of existing methods is shortened, making the method more suitable for routine analysis of large numbers of samples. Recoveries from spiked soil samples (0.5-5.0 ppm) and water samples (0.1-2.0 ppm) averaged 91-98 and 80-94%, respectively. (Author abstract by permission)

74-0994. Chau, A. S. Y.; Demayo, A.; ApSimon, J. W.; Buccini, J. A.; Fruchier, A. (Can. Cent. Inland Waters, Burlington, Ontario, Canada L7R 4A6). **Chromous chloride reduction. VIII. Reaction of some derivatives and degradation products of heptachlor with chromous chloride-ethylenediamine complex and nuclear magnetic resonance and mass spectra of the products.** *J. Ass. Offic. Anal. Chem. 57(1): 205-216; 1974.* (34 references)

The use of the chromous chloride-ethylenediamine ($CrCl_2$-en) complex to speed dechlorination and minimize side-products has been explored for heptachlor metabolites and degradation products. Five pentachloro heptachlor derivatives are synthesized, and their nuclear magnetic resonance and mass spectra are presented and discussed. Nuclear magnetic resonance data support the *anti* assignment of H_7 in the major products from $CrCl_2$-en reduction of cyclodiene pesticides. The use of this reagent for possible development of chemical confirmatory tests for heptachlor metabolites and degradation products is also briefly discussed. (Author abstract by permission)

74-0995. Friestad, H. O. (Chem. Res. Lab., Agr. Univ. Norway, 1432 As-NLH, Norway). **Rapid screening method, including automated colorimetry, for low residue levels of linuron and/or chlorpropham in vegetables.** *J. Ass. Offic. Anal. Chem. 57(1): 221-225; 1974.* (11 references)

Linuron and/or chlorpropham are extracted from crop material with acetonitrile and the extracts are given preliminary cleanup with a slightly modified Mills-Onley-Gaither method. The herbicides are hydrolyzed to aromatic amines which, after automatic diazotization and coupling, are determined by colorimetry. The use of manual rapid and efficient cleanup and hydrolysis steps have made it possible to establish lower limits of detection of about 0.01 mg/kg, equivalent to those commonly obtainable by GLC, for the 4 crops tested. Recoveries from carrots and potatoes, when corrected for predetermined consistent procedural losses, averaged 95% with satisfactory precision. (Author abstract by permission)

74-0996. Baker, P. B.; Hoodless, R. A. (Dept. Trade Ind., Lab. Government Chemist, Cornwall House, London SE1 9NQ, England). **Agricultural fungicides II. Detection and identification of systemic benzimidazole fungicides on citrus fruit.** *J. Chromatogr. 87(2): 585-588; 1973.* (7 references)

Four systemic benzimidazole fungicides were easily detected and identified on citrus fruit by combining a thin layer separation and a bioassay technique. Fruit peels were extracted in ethyl acetate and chromatographed according to a published method. Plates were dried, sprayed with bicarbonate solution to neutralize acetic acid carrier, and sprayed with a spore suspension of *Cladosporium cladosporioides* and incubated for 2 days. Zones of inhibition of growth indicated the positions of the fungicides which were compared with those of standards included on the plates. Detectable amounts of fungicide in citrus fruit skin were 2.0 mg/kg for thiabendazole, 1.0 mg/kg for benomyl, 0.5 mg/kg for methyl benzimidazol-2-ylcarbamate, and 1.0 mg/kg for thiophanate-methyl.

74-0997. Zimmerli, B. (Eidgenoess. Gesundheitsamt, Abt. Lebensmittelkontrolle, 3001 Bern, Switerland). **Beitrag zur Bestimmung von Umweltkontaminantien mittels der hydrierenden Reaktionsgaschromatographie. [Contribution to the determination of environmental contaminants by carbon skeleton chromatography.]** *J. Chromatogr. 88(1): 65-75; 1974.* (28 references) (German)

Reaction products of some environmental contaminants (polychlorinated biphenyls, polychlorinated terphenyls, polychlorinated naphthalenes, polychlorinated dibenzo-*p*-dioxins, polychlorinated dibenzofurans, polychlorinated diphenyl ethers, and DDT-type compounds) resulting from carbon skeleton chromatography on a deactivated Pd-catalyst have been detected and identified by gas-liquid chromatography on different columns. In all cases the dehalogenated parent compound was obtained. Trace amounts (5-10 ng) could be determined quantitatively under specified conditions. The technique has been successfully used for the determination of polychlorinated biphenyls in biological material and of polychlorinated dibenzo-*p*-dioxins in pentachlorophenol. (Author abstract by permission)

74-0998. Struble, D. L.; McDonald, S. (Res. Sta., Canada Dept. of Agr., Lethbridge, Alberta T1J 4B1, Canada). **Residue analysis of leptophos, its oxygen analogue, and its phenol in field-treated wheat plants.** *J. Econ. Entomol. 66(6): 1321-1325; 1973.* (13 references)

Field-grown plants were treated at the early tillering stage with leptophos (*O*-[4-bromo-2,5-dichlorophenyl] *O*-methyl phenylphosphonothioate) EC, 1970 formulation, at 0.56 and 1.12 kg AI/ha. Recoveries from fortified plant samples ranged from 70 to 102% for leptophos, from 51 to 99% for its oxygen analogue (*O*-[4-bromo-2,5-dichlorophenyl] *O*-methyl phenylphosphonate), and from 68 to 97% for its phenol (4-bromo-2,5-dichlorophenol). Straw harvested 63 days posttreatment contained 0.07 ppm or less leptophos, 0.01 ppm or less of the phenol, and the oxygen analogue was not detectable (< 0.02 ppm). Residues were not detected in the wheat kernels. The leptophos residue was diluted by plant growth, but the main disappearance of leptophos appeared to be due to degradation or physical losses, or to both. (Author abstract by permission)

74-0999. Mukherjee, G.; Banerjee, T. S.; Mukherjee, A. K.; Mathew, T. V. (Cent. Food Lab., Calcutta, India). **Colorimetric estimation of dichlorvos (DDVP).** *J. Food Sci. Technol. 10(3): 126; 1973.* (10 references)

A simple, accurate method which has a sensitivity of 1 μg has been developed for the determination of dichlorvos. A standard curve was prepared by adding 1 ml of 5% NaOH to tubes containing small amounts (10, 20, 30, 40 μg) of dichlorvos, cooling for 30 min., and shaking the hydrolyzed solution with carbon tetrachloride and alcohol and then distilled water and CS_2 to produce a blue solution. Color intensity was read on a colorimeter within 15 min. The color obtained was probably due to the formation of complex sodium xanthate produced by CS_2, ethyl alcohol, and alkali.

74-1000. Kulkarni, J. R.; Reddy, R. K. (Chem. Examiner's Dept., Andhra Pradesh, Hyderabad, India). **A new locating agent for detection of endrin by thin layer chromatography.** *J. Indian Acad. Forensic Sci. 11(2): 15-16; 1972.*

A method of detection specific for endrin in the presence of malathion and parathion was developed using TLC and a new spray reagent. Material was spotted on silica plates, carried in hexane:acetone (9:1) and sprayed with 0.25% brilliant green (a malachite green) solution followed by ceric ammonium sulfate in normal sulfuric acid. Green spots appeared for all three compounds, with satisfactory resolution, and spots of malathion and parathion faded after about 45 min. The endrin was stable for days, giving a basis for more specific identification.

74-1001. Toth, A.; Ronane-Kovacs, Z.; Balazs, E. (Dept. Chem., Univ. Horticult., Budapest, Hungary). **2,4-diklorfenoxi-ecetsav szermaradvany gazkromatografias meghatarozasa. [Gas-chromatographic determination of 2,4-dichlorophenoxy acetic acid residues.]** *Kerteszeti-egyetem Kozlem. 35(3): 309-316; 1971.* (6 references) (Hungarian)

Gas chromatography was used for the quantitative determination of 2,4-D in plums, apples, apricots, peaches, currants, and morello cherries grown near a chemical plant manufacturing Dikonirt. The fruit juice was acidified with sulfuric acid for repeated extractions with chloroform and methanol under the addition of more sulfuric acid and sodium carbonate. Final extraction was done with *n*-hexane. The samples were methylated with perchloric acid to obtain 2,4-D methyl for gas chromatographic determination with electron capture detector. A Chromosorb-filled column with a temperature of 145°C, an evaporator temperature of 220°C, an electron capture detector temperature of 180°C, and nitrogen as carrier gas were used. The limit of 2,4-D detectability was determined as 0.05μg. Plums, apples, apricots, currants, and morello cherries contained 0.55, 0.15, 0.08, about 0.01, and 0.18 ppm of 2,4-D.

74-1002. Kutlukova, U. S.; Toropov, A. P.; Lozovatskaya, M. S. (Tashkent Polytechnical Inst., Tashkent, USSR). **Opredeleniye monurona, diurona i fenurona metodom anodnoy vol'tamperometrii. [Determination of monuron, diuron, and fenuron by anodic voltamperometry.]** *Khim. Sel. Khoz. 11(4): 296-298; 1973.* (3 references) (Russian)

A polarographic method is described for the quantitative determination of monuron, diuron, and fenuron in wettable powders, dusts, and granules as well as in soil. With a relative error of ±3%, the determination in pesticide preparations and in the soil takes 20-25 min and 1.5-2 hr, respectively. A polarograph with an automatic recording unit and microdisc platinum electrode as anode is used for the determination. Powder and granulate preparations are dissolved in methanol, after which the sample is diluted with distilled water. The sample is

transferred into an electrolyzer for polarographic determination, starting from a voltage of 1 V. Soil samples are comminuted and then combined with alcohol or acetone. The resulting filtrate is combined with a 0.1 *N* solution of lithium perchlorate in acetonitrile. The pesticide content is obtained by means of a calibration curve or by computation, using a conversion factor of 4.29 mm • ml/g.

74-1003. Abramova, K. A.; Panasyuk, T. D.; Kalinina, Ye. A. (Author address not given). **Opredeleniye tordona 22-K v pochve i rasteniyakh biologicheskim metodom. [Bioassay of picloram in soil and plants.]** *Khim. Sel. Khoz. 11(4): 298-300; 1973.* (4 references) (Russian)

Picloram contents were determined in plants and soil by measuring the decrease in the surface area of intact bean plant leaves. Measurements of the leaf surface areas of bean plants grown in soils with 0.0036 to 0.0327 mg of picloram per kg yielded data for leaf surface reduction from which regression coefficients of 2.1109 to 2.7163 were computed. Whth a sensitivity of 0.003-0.004 mg/kg of soil, the accuracy of the bioassay lies at 20%. The accuracy for plant samples is dependent on the quantity of the composted sample. The application of this method for soil containing picloram-contaminated winter wheat straw compost revealed much higher picloram concentrations in the straw than in the soil in which the wheat was grown, 12.28 mg/kg of straw against 0.4 mg/kg of soil.

74-1004. Rezunenko, O. A.; Tret'yak, M. G.; Shokol, V. A. (Inst. Org. Chem., Acad. Sci., USSR). **Identifikatsiya i kolichestvennoye opredeleniye demufosa v vode. [Identification and quantitative determination of demuphos in water.]** *Khim. Sel. Khoz. 11(5): 364-365; 1973.* (4 references) (Russian)

A qualitative thin-layer chromatographic and quantitative colorimetric determination of demuphos (*O,O*-dimethyl *N*-methyl *N*-isopropoxycarbamoyl phosphate) in water is described. For qualitative determination, demuphos is extracted from water by means of carbon tetrachloride and is identified on an alumina layer, using a 3:2 mixture of hexane with acetone as solvent system. With an Rf value of 0.53 the sensitivity of the thin-layer chromatographic determination amounts to 0.075 μg. For quantitative, colorimetric determination the water sample is combined with sodium chloride, after which extraction is done with carbon tetrachloride. After removal of the extractant, and the addition of distilled water, the sample is combined with potassium persulfate, boiled, neutralized until the development of pink coloration, after which molybdenum reagent and ascorbic acid are added prior to boiling. Colorimetric determination is done against distilled water. Concentrations ranging from 50 to 600 μg/l. obey the Beer-Lambert law.

74-1005. Cranmer, M. F.; Peoples, A. J. (Nat. Cent. Toxicol. Res., Jefferson, AR 72079). **Measurement of blood cholinesterase activity in laboratory animals utilizing dimethylbutyl acetate as a substrate.** *Lab. Anim. Sci. 23(6): 881-884; 1973.* (8 references)

Blood cholinesterase activity was measured by incubation of a 20μl. sample with 3,3-dimethyl butyl acetate (DMBA) in pH 8 buffer for 30 min. and measurement of the reaction product by flame ionization GC. Red cell and plasma ChE values were similar to those obtained by the pH Stat method in the case of the monkey, dog, and rabbit, but in the case of the rat and mouse much higher values were obtained, suggesting the presence of large amounts of non-choline esterase in these animals. The method was suitable for detecting the effect of 1/4 LD50 carbaryl or parathion on monkey, rabbit, and dog ChE. Inhibition following these doses ranged from 19 to 88%.

74-1006. Thielemann, H. (Halberstadt, DDR-36). **Zur semiquantitativen duennschichtchromatographischen Bestimmung von Toxaphen an Kieselgel-G-Schichten und Fertigfolien. [Semiquantitative thin-layer chromatographic determination of toxaphene on silicagel-G layers and ready foils.]** *Mikrochim. Acta 4: 519-520; 1973.* (2 references) (German)

A brief description is given of a semiquantitative thin-layer chromatographic method for determining toxaphene residues, especially in plant materials. In the absence of residues of other organochlorine pesticides, such as DDT, DDE, endrin, aldrin, dieldrin, BHC, and DMDT (methoxychlor), toxaphene residues can be determined semiquantitatively on silicagel-G layers and ready foils previously activated at 110°C for 2 hr, using a 95:5 mixture of propanol with ammonia as solvent system. Following evaporation of the solvent system and visualization of the spots by means of ammoniacal silver nitrate solution, the foils or thin layers must be exposed to UV light for 10 to 15 min. The limit of detectability is 0.5 μg; semiquantitative determination is possible at a minimum quantity of 1μg.

74-1007. MacNeil, J. D.; Frei, R. W.; Hutzinger, O. (Trace Anal. Res. Cent., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Electron-donor-acceptor complexing reagents in the analysis of pesticides. VI. Influence of structure in detection and identification.** *Mikrochim. Acta 5: 641-650; 1973.* (13 references)

An analytical procedure suitable for formulation analysis or laboratory pesticide decomposition studies has been established using π-complex formation on thin layer chromatograms for detection and quantitation and MS of the complex for positive identification. Investigation of the influence of various substituent groups on the electron-donor and electron-acceptor properties of pesticides showed amiben, fuberidazole, fenthion, 1-naphthyleneacetic acid, and ametryne to be good

donors and Bulbosan (trichlorotrinitrobenzene) and daconil (chlorothalonil) good electron acceptors. DNBP, in which 2 nitro groups negate the influence of the donor -OH and $-CH(CH_3)_2$, exhibited weak color formation. Silvex and dichlone exhibited both acceptor and donor properties. Nitrofluorene compounds and methylated aromatic amines were the best spray reagents for MS studies.

74-1008. Zimmerli, B.; Marek, B.; Sulser, H. (Sektion Pestizide und Kontaminationen, Eidg. Gesundheitsamt, Bern, Switzerland). **Erfahrungen bei der Bestimmung von chlorierten Biphenylen und chlorhaltigen Pestiziden. [Experiences in the determination of polychlorinated biphenyls and organochlorine pesticides.]** *Mitt. Geb. Lebensmittelunters. Hyg. 64(1): 70-79; 1973.* (24 references) (German)

Column chromatographic, gas chromatographic, and thin-layer chromatographic methods for the differentiation and quantitative determination of Aroclor type polychlorinated biphenyls and DDT and its metabolites are described on the basis of investigations of cheese fat samples. Separation of BHC, lindane, *p,p'*-DDD (TDE), and *p,p'*-DDT from mixtures with Aroclor 1254 type PCBs was possible on a Florisil column with petroleum ether as eluant. The combination of simple chemical reactions, such as hydrolysis and/or subsequent oxidation, was suitable for the gas chromatographic determination of DDT, DDD, and DDE in the presence of small quantities of PCBs. Catalytic hydrogenation to biphenyl (carbon skeleton chromatography) was a convenient method for identifying and quantitatively determining even small amounts of PCBs. Oxidation with chromic acid was suitable for the differentiation of heptachlor and *p,p'*-DDE from Aroclor in the thin-layer chromatographic determination of PCB residues in food packaging materials, using alumina plates and 5% benzene in hexane as solvent.

74-1009. Hadorn, H.; Zuercher, K. (Zentrallaboratorium, Coop Schweiz, Basel, Switzerland). **Isolierung der Rohextrakte fuer Rueckstandsbestimmung von Insektiziden in verschiedenen Lebensmitteln. [Isolation of crude extracts for determination of insecticide residues in various foods.]** *Mitt. Geb. Lebensmittelunters. Hyg. 64(2): 266-274; 1973.* (4 references) (German)

A universal method for the isolation of crude extract from any food product for subsequent organochlorine pesticide residue analyses is described on the basis of a standard method prescribed for the analysis of pesticides in cheese. The sample to be analyzed is placed in a centrifuge tube, combined with sodium oxalate in acetic acid, methanol and petroleum ether, and homogenized by means of an ultrasonic mixer. Following centrifugation, the petroleum ether phase incorporating the lipids and the organchlorine pesticide residues is separated. Low-fat samples are combined with peanut oil prior to homogenization to avoid pesticide losses. The insecticides are separated from the lipids by column chromatography. The universal method is suitable for the isolation of raw extracts with α-BHC, lindane, heptachlor, aldrin, heptachlor epoxide, DDE, DDT, and dieldrin residues from such foods as cheese, tinned fish, condensed milk, cocoa beans, powdered milk, chocolate, biscuits, oil seeds, butter, shortening, grease, grains, flour, vegetables, fruits, coffee beans, eggs, meat, fish, canned foods, and cigarettes.

74-1010. Stijve, T.; Cardinale, E. (Contr. Lab. Nestle Products Tech. Assistance Co., Ltd., 1814 La Tour de Peilz, Switzerland). **The determination of chlorinated pesticide residues by entrainment distillation with water.** *Mitt. Geb. Lebensmittelunters. Hyg. 64(3): 415-426; 1973.* (4 references)

A simple, inexpensive method for confirmation of pesticide residues was developed based on entrainment distillation with water. The apparatus used was that designed for isolation of essential oils, which are lighter than water, from herbs and spices, fitted with an elongated condensor. The distillate was continuously extracted with toluene and the extract analyzed by electron capture GC. Recovery of lindane, dieldrin, tetrasul, and phencapton from fortified apple puree was good, but parathion appeared to be hydrolyzed when more than 50 ml of water or greater than 1 hr distillation were used. Organochlorine residues were quantitatively distilled from flour, fruits, vegetables, and tobacco in four hours, and the results agreed with those of the A.O.A.C. method. DDT isomers were partially degraded to TDE analogs in the cases of tobacco and chicory. The time required for removal of most organochlorines from fats and oils made the method impractical for such determinations.

74-1011. Casida, J. E.; Holmstead, R. L.; Khalifa, S.; Knox, J. R.; Ohsawa, T.; Palmer, K. J.; Wong, R. Y. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Toxaphene insecticide: a complex biodegradable mixture.** *Science 183(4123): 520-521; 1974.* (9 references)

Adsorption and gas-liquid chromatography separate toxaphene into at least 175 polychlorinated 10-carbon compounds including Cl_6, Cl_7, Cl_8, Cl_9, and Cl_{10} derivatives. One toxic component is 2,2,5-*endo* 6-*exo*-8,9,10-heptachlorobornane. Rats metabolically dechlorinate toxaphene, removing about half of the chlorine from the technical insecticide and from each of seven subfractions of varying composition and toxicity. (Author abstract by permission. Copyright 1974 by the American Association for the Advancement of Science)

74-1012. Fukuhara, K.; Takeda, A.; Tanabe, H. (Safety Center for Foods and Drugs, Tokyo, Japan). **[Studies on**

the methods of analyzing pesticide residues in foods, report 10. On the analytical method of organophosphorus pesticide. Part I.] *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 14(3): 304; 1973.* (Japanese)

Gas chromatographic conditions were examined for analyzing organophosphorus pesticides using a flame photometric detector. Recovery of pesticides such as diazinon, dimethoate, malathion, parathion, cidial (phorate), Surecide (*p*-cyanophenyl ethyl phenylphosphonothionate), and ethion which were added to vegetables and fruits was examined. The fortified food, homogenized in a blender, was first extracted twice with acetone; after addition of 2% aqueous NaCl solution the pesticide was transferred to dichloromethane. After washing and dehydration, the dichloromethane layer was condensed to five ml. The condensate was treated on a column of activated charcoal plus avicel (1:10), developed, and eluted with *n*-hexane containing 30% acetone. The concentrated eluate was injected onto a gas chromatograph with a column packed with 2.5% DC-200 plus 0.25% EPON 1009 at 1.0 kg/cm^2. Hydrogen and air flow rates were 150 and 50 ml/min. The second extraction was preferably performed with aqueous acetone to prevent the excessive extraction of food material. Recovery was nearly satisfactory.

See also **74-0813**

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